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Current status of interfirm relationships in Japan: An overview of the Teikoku Databank data[†]

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1. Introduction

The aim of this paper is to describe the current status of interfirm relationships in Japan with a special emphasis on trade credit between firms. Payment for interfirm transactions is usually made on account, or by payment after the delivery, rather than by immediate payment. Because late payment is nothing but a provision of credit from a seller to a buyer, this interfirm lending (borrowing) is called trade credit. Trade credit is used all around the world and accounts for a large portion of firms' balance sheets. However, due to the lack of detailed data, researchers have long encountered serious difficulty in clarifying how and why firms use trade credit.

In cooperation with Teikoku Databank Ltd., the largest credit information provider in Japan (hereafter called TDB), we, as members of the research group of the Program for Promoting Social Science Research Aimed at Solutions of Near-Future Problems addressing the "Design of Interfirm Network to Achieve Sustainable Economic Growth," construct a very unique and huge data set of Japanese firms to review how they trade with each other. The main data are from TDB's latest credit reports for about 380,000 firms in Japan during the 2007–2010 period and from the accompanying financial statement data. To grasp the entirety of this huge data set, which is almost the same as a picture of all firms in current Japan, this paper summarizes descriptive statistics and conducts some univariate analyses. We also provide the legal background in Japan that might be relevant when conducting further analysis using this data set.

This paper provides basic information from our data set, which we can use as a reference for a more detailed empirical analysis in the future. In a similar vein, we have a companion paper (Ono et al. 2010) that also describes the current status of firms in Japan based on the TDB data, but focuses on bank-firm

relationships.

The remaining part of this paper is composed as follows. In the next section, we briefly describe the original TDB data and our sample selection process. We also present descriptive statistics to characterize our sample firms. Section 3 provides a description and analysis of trade credit in Japan. Section 4 describes the legal framework in Japan, and Section 5 concludes.

2. Data and sample characteristics

2.1. Data

2.1.1. Original data

Our original data is from TDB's credit reports. The data are reports on firms that TDB researched on demand (i.e., in response to a request by a customer on a paid basis) or on an unsolicited basis, which is the case for important, established, or large firms in Japan. Although TDB researches them, we have eliminated financial firms and religious and educational bodies. We have also eliminated firms of which the corporate status is not ordinary. We only retain joint stock companies (*kabusiki gaisha*), closely held (limited liability) companies (*yuugen gaisha*), sole propriatorships (*kojin gaisha*), medical associations (incorporated) (*iryou houjin*), cooperative partnerships (unincorporated) (*kyoudou/kyougyou kumiai*), limited and unlimited liability partnership companies (*goumei/gousi gaisha*), and limited liability partnerships (*yuugenn sekinin jigyo kumiai*).

2.1.2. Sample period and our "cross-sectional" data

The original data include information from the TDB's credit reports from 2007 to 2010. During this period, quite a few of the sample firms appear multiple times in the data. This is due to the multiple requests to TDB to do credit research on these firms. Thus, the original data are pooled data (or cross-sectional and time-series data). However, because the time span (2007 through 2010) is relatively short, and because the aim of this paper is to grasp the whole picture of our sample firms, below we report descriptive statistics that are calculated in a cross-sectional manner. That is, even if the original data include multiple records of a particular firm at different points of time during the period, we use the latest record only and drop the others. In this sense, our data set is "cross-sectional." However, we still have about 380,000 firms as a base sample. Also, the eliminated data can be, and will be, recovered to construct a panel data set when we conduct research at a deeper level in the future.

2.1.3. Treatment of missing data

As shown in the main part of this paper, the number of observations for each variable differs depending on a "NA" or "unknown" value for some firms. However, we try to complement such data as much as possible by using other variables. For example, when a ratio that represents a composition of an item is unknown, but the sum of the ratios of the other items exceed 100%, the relevant ratio is set to zero.

2.1.4. Financial statement data and treatment of outliers

The credit reports often accompany financial statement data that TDB also researches on demand, or on an unsolicited basis. However, the number of observations for such data is significantly smaller than that for credit reports. Also, the variables from financial statement data sometimes take an extraordinary value. We have eliminated such data as outliers by dropping firms if their values fall into the largest and the smallest 0.1% ranges.

2.1.5. Descriptive statistics

In the tables for descriptive statistics shown later, the basic statistics we present are: N (the number of observations), mean, sd (standard deviation), min (minimum), p1 (1^{st} percentile), p50 (50^{th} percentile, or median), p99 (99^{th} percentile), and max (maximum). All the monetary variables are in Japanese yen. We also present additional frequency tables and figures where needed.

2.1.6. Univariate analysis

To better grasp the characteristics of the sample firms, we also conduct a univariate analysis, i.e. we split sample firms into multiple categories based on the values of one or more variables and calculate the descriptive statistics for each category. The variables used for this decomposition will hereafter be called the *base variables*. They comprise the number of employees and stock capital to represent firm size; net current profit and operating revenue (= sales) to represent firm performance; credit score, capital asset ratio, and the interest-bearing debt operating revenue ratio to represent creditworthiness. We also expand this list of variables if necessary to deepen the analysis. In accordance with the cross-sectional nature of our data set, we interact the value of all variables from the latest available period as long as their interval is equal to, or smaller than, 36 months.

2.2. Firm characteristics

2.2.1. Firm size

Table 2-1. The number of employees (persons)

N	mean	sd	min	p1	p50	p99	max
372,947	49.44663	426.1591	0	0	10	608	140,846

The mean number of employees for our sample firms is 49, while the median is 10. Although the number is skewed toward large firms, more than half of the firms are small firms hiring less than 10 employees. We also find that 6.03% of the firms hire no employees. More than 90% of the firms (92.1%) hire 100 or less employees, so the majority of the firms are SMEs. However, the sample does contain 1,933 firms (0.52%) that hire more than 1,000 employees.

Table 2-2. Capital stock

N	Mean	sd	p50	max

245,888	155,000,000	1,240,000,000	15,000,000	42,000,000,000

An average firm has 155 million yen (mean) or 15 million yen (median) of capital stock. If we do not drop the top and bottom 0.1% firms, the mean figure almost doubles.

Table 2-3. Operating revenue

N	mean	sd	p50	max
183,321	3,510,000,000	18,600,000,000	515,000,000	588,000,000,000

The mean operating revenue (= sales) of the sample firms is 3.5 billion yen, while the median is 0.5 billion.

2.2.2. Performance

Table 2-4. Net current profit

N	mean	sd	min	p50	Max
190,206	18,300,000	508,000,000	-12,400,000,000	1,865,000	12,300,000,000

As this table shows, sample firms, on average, earn 18.3 million yen (mean) or 1.87 million yen (median) of net current profit. We find that 26.4% of firms are in deficit (earn negative net current profit).

Table 2-5. Dividend payment

N	mean	Sd	min	p50	max
143,720	17,700,000	172,000,000	0	0	5,650,000,000

As shown by the zero median, the majority of the sample firms pay no dividend. Specifically, we find that more than 79.7% of the sample firms pay no dividend. However, the mean level of dividend payment is 17.7 million yen.

2.2.3. Firm attributes

Table 2-6. Firm age (years)

N	mean	sd	min	p1	p50	p99	max
373,695	27.62588	17.66175	0	1	26	68	130

This table shows that the average firm age (years since establishment) is 26 (median) or 28 (mean) years.

Table 2-7. Legal form of firms

	Freq.	Percent
Joint stock companies	298,386	77.14
Sole propriatorships	13,120	3.39
Limited and unlimited liability partnership companies	1,492	0.40
Closely-held (limited liability) companies	68,178	17.62

Others	5,650	1.46
Total	386,826	100

Stock companies account for 77% of the sample firms, and 17.6% of them are limited companies. Others include medical associations (incorporated), cooperative partnerships (unincorporated), and limited liability partnerships.

2.2.4. Ownership structure

In our sample, only 0.9% (3,394 out of 386,826 firms) are listed. Private companies are dominant.

As for ownership structure, we find that 64.3% of the firms (N = 288,607) are owner-managed, i.e., the majority of their capial stock is held by someone with the same surname as the representative (CEO). Only 7.9% of the sample firms (N = 386,641) are keiretsu firms, which is defined as those accepting equity investment from other companies that have effective decision-making power over the firms (e.g., subsidiaries, associate companies to which the equity methods is applicable, companies that belong to a group filing a consolidated tax return, etc.). Among the keiretsu firms (N = 27,183), 84% of them have a dominant shareholder, which are probably parent firms. The remaining keiretsu firms have no dominant shareholders, although they are affiliated with a keiretsu. Note, however, that the number of observations is small.

2.2.5. Region and industry

Among 47 prefectures in Japan, 21.8% of the sample firms are located in the Tokyo prefecture, and 9.9% of them are in the Osaka prefecture, which are the central prefectures of the east and west business areas in Japan. For other companies, 5.7% are in the Aichi prefecture (its capital is Nagoya city), 5.0% are in the Kanagawa prefecture (its capital is Yokohama city), 4.3% are in the Hokkaido prefecture (its capital is Sapporo city), but for any other prefectures the percentage is smaller than 4%.

Table 2-8. Industry

Industry	freq.	%
Agriculture	1,629	0.42
Forestry & hunting	157	0.04
Fishery	476	0.12
Mining	572	0.15
Construction	69,458	18.08
Manufacturing	73,482	19.13
Wholesale	89,367	23.27
Retail & restaurant	47,227	12.30
Finance & insurance	258	0.07

Real estate	14,151	3.68
Transportation & telecommunication	19,529	5.08
Electricity, gas, water, & heat supply	188	0.05
Services	67,590	17.60
Public services (not classified as others)	1	0.00
Unclassifiables	4	0.00

Table 2-8 shows the number of firms by industry (N = 384,089). The top five industries are: Wholesale (23.3%), Manufacturing (19.1%), Construction(18.1%), Services (17.6%), and Retail and restaurants (12.3%). As explained earlier, we try to eliminate financial firms, but as shown in this table some of them get through the sample selection process, such as credit card companies and agents for insurance. We need to eliminate them in future analysis.

2.2.6. Credit risk

TDB evaluates the credit scores (rating) of the firms in their database. They rate a firm and report a score that takes an integer value on a 1–100 scale. The score evaluates the soundness of the firm's management, the firm's repayment ability, and whether others can safely trade with the firm from a third-party viewpoint. The score is calculated based on a quantitative evaluation of financial figures, past performances, the operating history of the firms, and the qualitative evaluation of firms by researchers (including the evaluation of their managers (CEOs)). This score is unsolicited, i.e., the relevant firms do not pay for being rated. TDB notes that the average score fluctuates, depending on business conditions, in a procyclical manner.

Table 2-9. Credit score

N	mean	sd	Min	p1	p50	p99	max
367,224	47.52415	7.538036	1	30	48	66	88

As Table 2-9 shows, on average our sample firms are rated around 50 (47.5 (mean) and 48 (median)).

2.2.7. Financial ratios

Table 2-10. Financial ratios

	N	mean	sd	min	p1	p50	p99	max
(1) Capital / total asset	247,337	0.211	0.506	-9.333	-1.608	0.217	0.927	0.990
(2) Loans from financial institutions / total asset	150,931	0.498	3.973	0.000	0.000	0.383	1.399	280.597
(3) Operating profit / operating revenue	182,866	0.000	0.178	-6.168	-0.414	0.011	0.232	0.542
(4) Interest bearing	165,196	5.738	13.360	0.000	0.000	3.054	52.010	374.022

debt / (operating revenue/12)								
(5) Interest payments / total debt	157,041	0.034	0.077	0.000	0.000	0.025	0.221	2.616

This table shows summary statistics for different financial ratios that are calculated based on financial statements. Note that the number of observations is significantly smaller than that in previous tables because financial statement information is not available for all the sample firms. We can confirm the following facts:

(1) The mean capital asset ratio is 21.1% and the median ratio is 21.7%. We also find that 13.6% of the firms have excess debt (capital asset ratio less than zero).

(2) Borrowing from financial institutions accounts for 49.8% (mean) or 38.3% (median) of firms' balance sheets. We also find that there are some firms with no borrowing (7.3% of the sample), and other firms with excessive borrowing (the ratio greater than 1: 2.69% of the sample). When we interact this ratio with regional dummies, we find that Okinawa (33.6%), Nara (35.2%), Kagawa (36.1%), Wakayama (36.3%), and Nagasaki (37.2%) are the bottom five prefectures with a low average borrowing rate, while Gifu (85.3%), Gunma (82.6%), Tochigi (76.7%), Saga (74.2%), and Kumamoto (67.4%) are the top five prefectures (N=150,883).

(3) The mean operating profit operating revenue ratio (= operating profit / sales) is zero. Its median, 1.1%, is also small. These figures might be too small. They might reflect an economic slump during the sample period, but could also be the result of firms' efforts to reduce taxes.

(4) As for the interbearing debt operating revenue ratio, its mean is 5.74 and the median is 3.05. These numbers imply that, when using its own income, an average firm can repay debt in 3–5.7 months in the absence of no operating costs.

(5) The interest payment to total debt ratio is a proxy for an average annual interest rate. Its mean is 3.4% and its median is 2.5%. We also find that this ratio is zero for 1.4% of the firms. There are a few reasons for this zero interest rate, or no interest payments. It might be that the debt is with the owner-manager, that the firm was simply unable to repay debt, and/or that the payment was made but in a different year. Note that this ratio includes interest rates for securities other than bank loans, and so it does not necessarily equal the interest rate for bank debt.

With regards to the interest payment, when we conduct a future analysis, we should take into account the effect of one of the most important laws, the Interest Rate Restrictions Law (IRRL). The IRRL places caps on the rate of interest to be accrued on a loan at 20 percent per annum if the principal is less than 100,000 yen, 18 percent if the principal is 100,000 yen or more but less than 1 million yen, and 15 percent if the principal is 1 million yen or more. Any agreement on the interest in excess of these caps is null and void.[1]

[1] As shown above, the maximum for the interest payments to total debt ratio is 261.6%, which is greater than the 20% cap. However, this does not imply that the law is ineffective because the ratio is calculated based on financial statement

2.3. Comparison with other surveys

To understand how representative our sample firms are, it is useful to compare the summary statistics from the TDB database with those of several government corporate surveys. These surveys include the Census of Establishments and Firms (hereafter called the Census), which is the census survey of all the firms (incorporations and proprietorships) operating in Japan; and the annual Basic Survey of Small and Medium Enterprises (hereafter called the Basic SME Survey), which describes SME characteristics in Japan.

In terms of the number of firms, the 2006 Census reports that the number of corporations in Japan is 1,493,258. The maximum number of corporations in our TDB database is 373,706 (excluding the number of proprietorships from the entire sample). The coverage of the TDB database is indeed limited, but it covers a sizable portion of the total population.

In the Census, the industry with the largest share is Construction (18.5%), followed by Retail (17.6%), Manufacturing (17.1%), Services (14.0%), and Wholesale (11.6%). In our data set Wholesale dominates the others at 23.3%, followed by Manufacturing (19.1%), Construction (18.1%), Services (17.6%), and Retail & restaurant (12.3%), which indicates that wholesale and manufacturing industries have a relatively larger share in the TDB database than they do in the Census.

Regarding the firm size (employee size), the median firm in the 2006 Census employs four or less employees. As we have already shown above, the median number of employees is ten in the TDB database. The TDB database has a sufficiently large number of small firms for analysis, but its size distribution is somewhat skewed toward the right relative to the population of the Census.

Finally, regarding the average (mean) capital ratio, the ratio in the 2009 Basic SME Survey (27.7%) is higher than that in our database (21.1%). This suggests that firms in the TDB data base are more dependent on liabilities (including bank loans) than those in the Basic SME Survey.

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2.4. Univariate analysis of the borrowing ratio and the interest rate

Table 2-11. Borrowing ratio by the number of banks

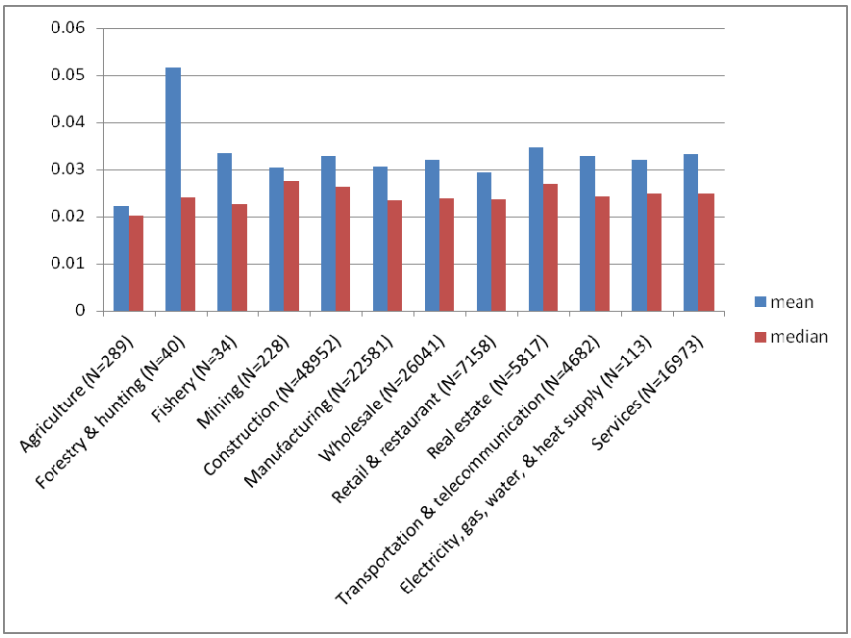
# of banks	N	mean	sd	min	p50	Max
1	12,197	0.380439	3.322464	0	0.194805	227.2727
2	28,508	0.458659	4.285322	0	0.28653	270.4342
3	34,401	0.472492	3.689403	0	0.349275	264.1829
4	27,983	0.532851	4.739675	0	0.397562	280.5974
5	18,772	0.551503	4.093062	0	0.433202	242.8941
6	11,478	0.518996	2.827121	0	0.466544	225.9816

numbers (i.e., interest payments in income statements that are flow variables, and total debt in balance sheets that is a stock variable), and might sometimes be a poor proxy for the actual interest rate due to the mismatch between the numerator and the denominator.

7	7,006	0.555256	3.868429	0	0.485639	260.2589
8	4,116	0.551445	2.910753	0	0.500524	183.5441
9	2,417	0.617612	5.596556	0	0.512654	275.3903
10	1,464	0.562806	1.757387	0	0.524867	67.15974
11 or more	2,511	0.556256	0.545585	0	0.541727	18.02193
Total	150,853	0.497596	3.973888	0	0.382732	280.5974

When we break down the borrowing ratio (loans from financial institutions over total asset) by the number of banks, the median ratio is smoothly increasing, which might reflect firms' and/or banks' risk diversification, or a greater ability of more creditworthy firms to borrow from more banks (see Table 2-11). The positive association between the two variables is also present, but less clearly, in the case of the mean.

Figure 2-1. Interest rate by industry



Turning to the interest rate (interest payment / (long-term + short-term borrowing)), its industry breakdown (N = 132,908) shows that the mean rate is between 2.9% and 3.5% for most industries (see Figure 2-1). Forestry and hunting (5.17%) and Agriculture (2.22%) are exceptions, but the number of observations for these industries is small. The median rate exhibits no industry variation and ranges from 2.02 (Agriculture) to 2.74% (Mining).

Table 2-12. Interest rate by the number of employees

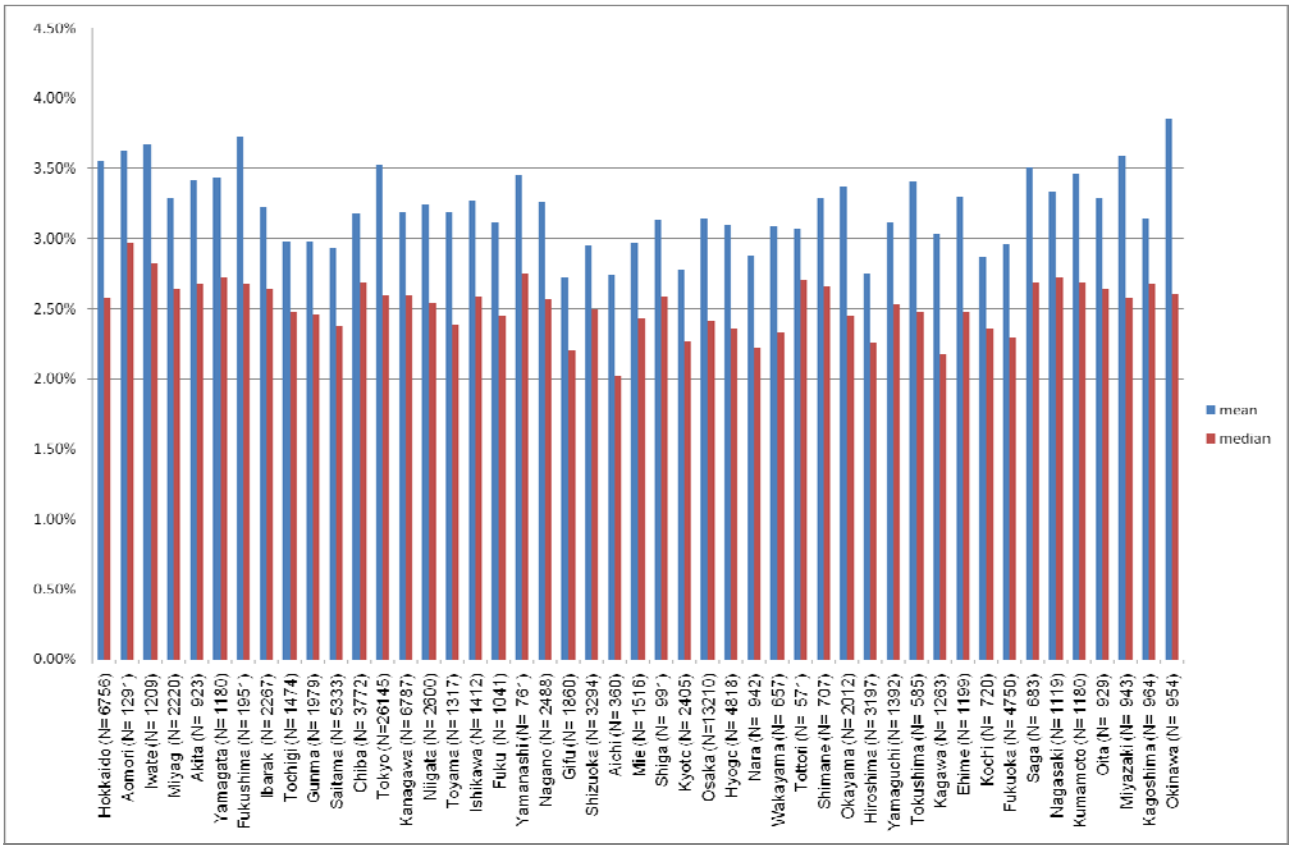
x= # of employees	N	mean	sd	min	p50	max
x=0	3,317	3.050%	5.440%	-0.820%	2.350%	142.6%
0<x<=3	14,506	2.960%	5.760%	0.000%	2.370%	217.1%

3<x<=6	17,479	3.060%	5.050%	0.000%	2.530%	212.8%
6<x<=10	18,067	3.220%	5.780%	0.000%	2.600%	196.0%
10<x<=20	25,948	3.310%	6.390%	-1.550%	2.610%	253.4%
20<x<=50	26,704	3.320%	6.800%	0.000%	2.530%	261.6%
50<x<=100	12,106	3.240%	7.010%	-0.230%	2.370%	253.0%
100<x<=300	9,547	3.260%	7.670%	0.000%	2.280%	247.8%
300<x<=1000	3,480	3.640%	10.540%	0.000%	2.120%	258.3%
1000<x	1,157	3.850%	13.500%	0.000%	1.830%	236.2%
Total	132,311	3.220%	6.550%	-1.550%	2.480%	261.6%

When broken down by firm size (the number of employees as shown in Table 2-12), the mean interest rate is slightly increasing in general, but the median rate is an inverted-U shape. The reason for the slight increase might be more borrowing from CEOs or relatives (which is presumably interest-free) for smaller firms. Similar relationships exist when the rate is broken down by credit score, capital stock, and operating revenue, and to a lesser extent when broken down by capital asset ratio and net current profit.

These findings seem to indicate that larger, more creditworthy, and better-performing firms pay higher interest rates on average (in means). However, the standard deviation is also greater for larger, more creditworthy, and better-performing firms. So a small number of such firms are paying very high interest rates. In terms of median interest rates, it is the intermediate firms that pay higher interest rates.

Figure 2-2. Interest rate by prefecture



When broken down by prefecture (N = 133,127), we see some dispersion in interest rates across regions (Figure 2-2: north (south) prefectures from the left (right)). The top five prefectures (those with the highest interest rates) are: Okinawa (3.86%), Fukushima (3.73%), Iwate (3.67%), Aomori (3.63%), and Miyazaki (3.59%) in mean; and Aomori (2.97%), Iwate (2.82%), Yamanashi (2.74%), Yamagata (2.72%), and Nagasaki (2.72%) in median. The bottom five prefectures (those with the lowest interest rates) are: Gifu (2.72%), Aichi (2.74%), Hiroshima (2.76%), Kochi (2.86%), and Nara (2.88%) in mean; and Aichi (2.02%), Kagawa (2.18%), Gifu (2.21%), Nara (2.22%), and Hiroshima (2.26%) in median.

Kyoto and Aichi prefectures are anecdotally considered low interest rate prefectures due to harsh bank competition, while prefectures in the Tohoku area (including Aomori, Iwate, and Yamagata) are considered high interest rate ones. The “Aichi rate” and the “Tohoku rates” are indeed observed, but the “Kyoto rate” is not. It would be interesting to investigate the reasons for such regional differences, e.g., bank competition, business condition, industry distribution, etc. Note, however, that the interest rate here is not the interest rate for bank borrowing.

Further, when we break down the interst rate by the number of banks that the firms transact with (N = 132,727), the mean rate does not differ depending on the number and takes a value between 3.05 and 3.38%. The median rate increases from 2.26% for firms that transact with a single bank to 2.84% for firms that transact with 11 or more banks. If this is a significant increase, then it is puzzling because bank competition should reduce interest rates. It might be the case that financially constrained firms try to borrow from more banks. Alternatively, it might be that the number of banks represent firm size, large firms borrow for longer

maturity, and long maturity loans are expensive. The other possible reason is that firms borrowing from more banks are more risky. This final interpretation is consistent with our finding above that firms that transact with more banks have a higher borrowing ratio (leverage).

3. Trade credit

3.1. Trade counterparts

Table 3-1. The number of suppliers and customers

	N	mean	sd	min	p1	p50	p99	max
# of suppliers	324,734	47.243	247.761	0	1	20	400	70,000
# of customers	241,335	278.465	1,814.865	0	1	40	3,500	90,504

As Table 3-1 shows, an average sample firm purchases from 47 (in mean) or 20 (in median) suppliers, and sells to 278.5 (in mean) or 40 (in median) customers. The number of customers is larger than that of suppliers. Both individuals and corporations are included in these figures, but TDB explains that the unspecified (i.e., large) number of (retail) customers is not included in the number of customers. If we interact the number of suppliers and that of customers (N = 224,304), the latter is gradually increasing with the former (increases at an increasing rate).

The TDB database identifies firms' *main* suppliers and customers, although the definition of the "main" is unclear. We also have information about average monthly purchases from the main suppliers. We can therefore calculate the degree of dependence on the main suppliers as the ratio of total purchases from main suppliers and monthly purchases (cost of goods sold).

Table 3-2. Degree of dependence (%) on main suppliers

	N	mean	sd	min	p1	p50	p99	max
main suppliers total	57,315	61.292	27.672	0.022	6.534	60.544	100	100
top supplier only	58,185	49.192	29.302	0.006	5	45	100	100

As Table 3-2 shows, about 60% of purchases are from main suppliers. This dependence reduces to 45–50% if we focus on the top supplier only.

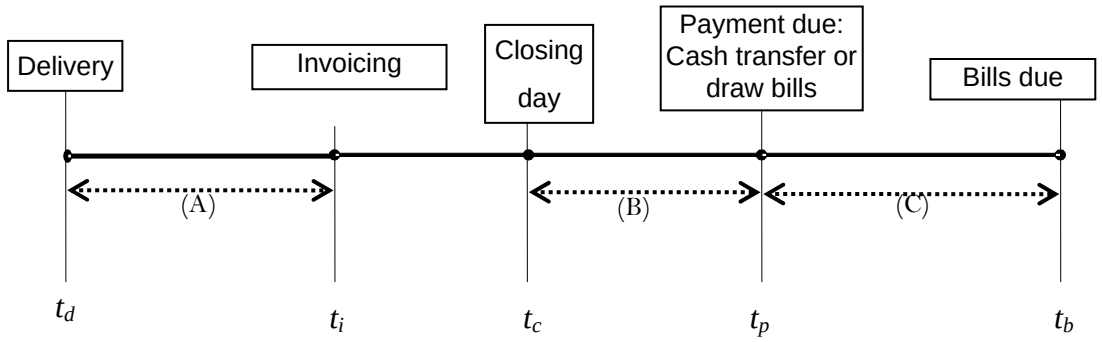
Table 3-3. Degree of dependence (%) on main customers

	N	mean	sd	min	p1	p50	p99	max
main total	92,539	69.514	29.362	0.004	7	80	100	100
top only	92,981	58.099	32.102	0.003	5	60	100	100

We can also calculate the degree of dependence on main customers based on sales information. As Table 3-3 shows, about 70–80% of the sales are to main customers. Sales to the top customer account for about 60% of the total sales.

3.2. Trade credit practice in Japan

Figure 3-1. Trade credit practice in Japan



Before presenting trade credit statistics, it would be useful here to briefly explain the trade credit practice in Japan to get an idea of what these statistics convey.[2] The figure above illustrates how corporate payments typically proceed in Japan from a buyer's viewpoint.

Suppose a transaction deal is done and the product is delivered (or service is provided) to the buyer at $t = t_d$. It then takes time for the seller (period (A)) to complete the necessary paperwork, issue an invoice, and present the invoice to the buyer ($t = t_i$). Account payables/receivables are recorded on the buyer's/seller's book either on t_d or on t_i.[3]

It is conventional for firms in Japan to have their own *closing day* ($t = t_c$) in each month (e.g., the end of month). On the closing day they accumulate debts and credits that have emerged during the month, and settle the balance vis-à-vis each seller. Having a closing day helps firms to reduce transaction costs from processing multiple payments.

The day a seller receives cash differs depending on what method of payment the buyer uses. Irrespective of what method is used, a day that is typically called the "*payment day*" ($t = t_p$) comes a certain number of days after the closing day (e.g., 30 days). If a buyer makes a payment by *bank transfer*, which is one of the most common methods of payment in Japan, the buyer electronically transfers cash from his/her own demand deposit account to the seller's account on or before the "payment day." Once the transfer is made, the seller then can immediately withdraw the cash.[4]

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[2] The explanation that follows borrows much from Uchida, Uesugi, and Hotei (2010).

[3] Accounts receivables (payables) are an open account credit (debt). An open account credit is the most common form of trade credit in many countries. The evidence of a buyer's indebtedness is the seller's entry of the transaction in the sales ledger for that customer (Emery and Ariga 1996).

[4] Interviews with practitioners suggest that the use of checks as a method of payment on the payment day is very rare. As checks are immediately refundable, they are used as an alternative to immediate cash payment (i.e., not for credit payment).

However, payments in Japanese firms might be made through another common method of payment: *promissory bills* (promissory notes, or *yakusoku tegata* in Japanese).[5] In the case of promissory bills, a "payment day" is not a day when the seller (can) actually receives cash. Rather, it is the day when the seller receives (and the buyer "pays") a paper-based bill that the buyer issues. The bill is refundable only at or after its due day ($t = t_b$), which usually comes a few months after the "payment day" (period (C)). At or after the due day, the seller deposits the bill at a bank, the bank takes the bill to a regional clearinghouse that is run by banks and is open every business day, and the bill, together with other bills collected on that day, is settled and cleared through the bank settlement system. In principle, it is only after this process that the seller can receive cash. This means that although t_p is typically called a "payment day," actual payment is not made on t_p when a promissory bill is used. [6] Due to this time difference, the maturity of promissory bills is longer than that of a bank transfer by a few months.

Similar to the case of a bank transfer, until the "payment day," payments through promissory bills are recorded on the buyer's (seller's) book as account payables (receivables). However, once a bill is issued, the account payables (receivables) are turned to "bill payables (receivables)" on the book and the bill serves as evidence of a buyer's indebtedness.

When promissory bills are used, the seller can liquidate them by having a bank discount them, or use the bills as collateral for a loan (as long as the bank agrees to do so). Liquidation of promissory bills is one of the main banking services through which banks in Japan earn commissions.[7] Also, a seller can endorse promissory bills and use them as his/her own method of payment (as long as the receiver accepts it). The relatively extensive use of promissory bills in Japan might be linked to the institutional framework that fascilitates the liquidation of them in these manners. Note, however, that the endorsee or the bank has recourse against the seller when the original buyer defaults; so that, even after the liquidation, the seller still assumes all the credit risk. Also, these methods of discounting promissory bills do not change the duration of the original credit extended to the buyers. So, regardless of whether a bill is liquidated or not, the seller assumes all the credit risk of the original buyer until the due date of the bill.

A unique feature of promissory bills is that there is a strong enforcement mechanism for repayment. When a buyer (borrower) defaults on a promissory bill, the buyer's bank creates a "dishonor report" that it circulates to all the member banks of the clearinghouse. Another default during a six-month period triggers a suspension of banking transactions by the member banks for two years. Such a firm cannot survive because most of the banks participate in every clearinghouse (either directly or indirectly through agent banks). This serves as a strong enforcement mechanism for repayment of promissory bills.[8]

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[5] Whether to use a bank transfer or a promissory bill is determined when the original deal is done ($t = t_d$).

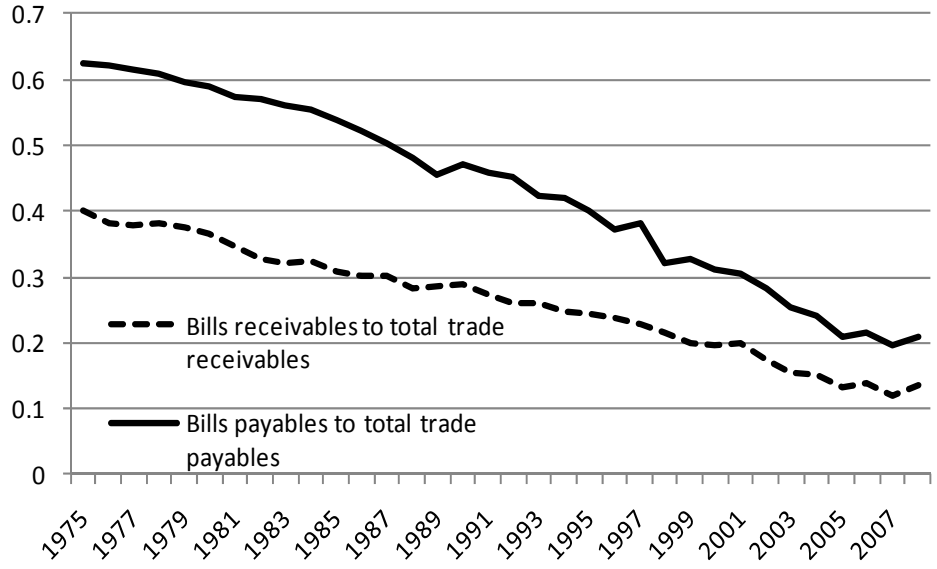
[6] Promissory bills and checks share similar characteristics. Both are paper-based and are cashed at a bank. One important difference is that checks can be cashed on demand, but promissory bills cannot be cashed until their due day.

[7] See Matsumura and Ryser (1995) and Miwa and Ramseyer (2008) for details on these methods of bills discounting.

[8] Checks written on checking-account deposits are also subject to the same penalty, but as checks can be cashed anytime after their issuance, they are used as a cash-equivalent.

The use of promissory bills or bills of exchange as a method of payment is not unique to Japan. For example, they are also being used in a few other Asian countries such as Korea and Taiwan.[9] Moreover, a similar method of payment, bills of exchange, was used in the U.K. until the nineteenth century (Bates and Hally 1982, p.168). In the past, firms in the U.S. also have used bills as a last resort to obtain credit when encountering serious financial difficulties (Steffen 1964, p.724). Nowadays, these methods are not extensively used for domestic transactions in the U.K. or in the U.S.[10] However, bills of exchange are still frequently used for international transactions.

Figure 3-2. The ratio of promissory bills in total trade credit



That being said, the use of promissory bills in Japan has been steadily declining over the past few decades. As shown in Figure 3-2 (adopted from Uchida, Uesugi, and Hotei 2010), the ratio of the outstanding amount of bills issued to the total amount of trade credit is steadily declining.[11] To investigate the cause of this decline, despite the strong enforcement mechanism for repayment attached to promissory bills, might be an interesting research topic.

[9] In Korea, about 30–35% (35–40%) of trade credit during the period of 1990–1995 consisted of bill receivables (payables) (Bank of Korea, *Financial Statement Analysis*, various years). Since 1996, the breakdown of trade credit is no longer reported.

[10] The present domestic U.S. payment system is distinctive from those in other OECD countries with its greater reliance on paper checks (James and Weiman 2010).

[11] The source of the data is the Financial Statements Statistics of Corporations by Industry from the Ministry of Finance: all industries and all sizes.

3.3. Method of payment

3.3.1. Composition

The TDB data provide us with information about the composition of different payment methods that the sample firms usually use (i.e., by what means the payment is made). We know what fraction of total payments are made by (1) cash (including bank transfer and checks), (2) promissory bills, (3) endorsement of promissory bills received as a method of payment from other firms, (4) setting-off (canceling out with trade receivables), and/or (5) prepayment. Note that category (1) includes payment by cash and by checks and does not necessarily represent payment on account. However, it will turn out later that almost all firms make payment on account, so category (1) represents credit payment. Category (2) (promissory bills) are the other method of credit payment in Japan.

The TDB data show that the fractions of firms that use these five methods of payment for their payment (for any non-zero amount) are respectively (1) 99.81% (N = 367,604), (2) 33.63% (N = 367,489), (3) 10.13% (N = 367,423), (4) 2.38% (N = 367,393), and (5) 0.21% (N = 367,378). The most dominant method of payment is cash. We also find that 59.74% of the firms use only cash when they make payments. Only 681 firms (0.19%) never use cash.

Table 3-4. Fraction of each payment used

Method	N	mean	sd	min	p1	p50	p99	max
(1) Cash	367,604	81.890	27.597	0	10	100	100	100
(2) Promissory bills	367,489	14.357	24.993	0	0	0	90	100
(3) Endorsement	367,423	2.956	11.209	0	0	0	60	100
(4) Setting-off	367,393	0.689	5.733	0	0	0	25	100
(5) Prepayment	367,378	0.099	2.624	0	0	0	0	100

Cash is also a dominant method of payment in terms of the fraction of its usage in the total payment. As Table 3-4 shows, cash on average is used for 81.9% (in mean) or 100% (in median) of the payment.

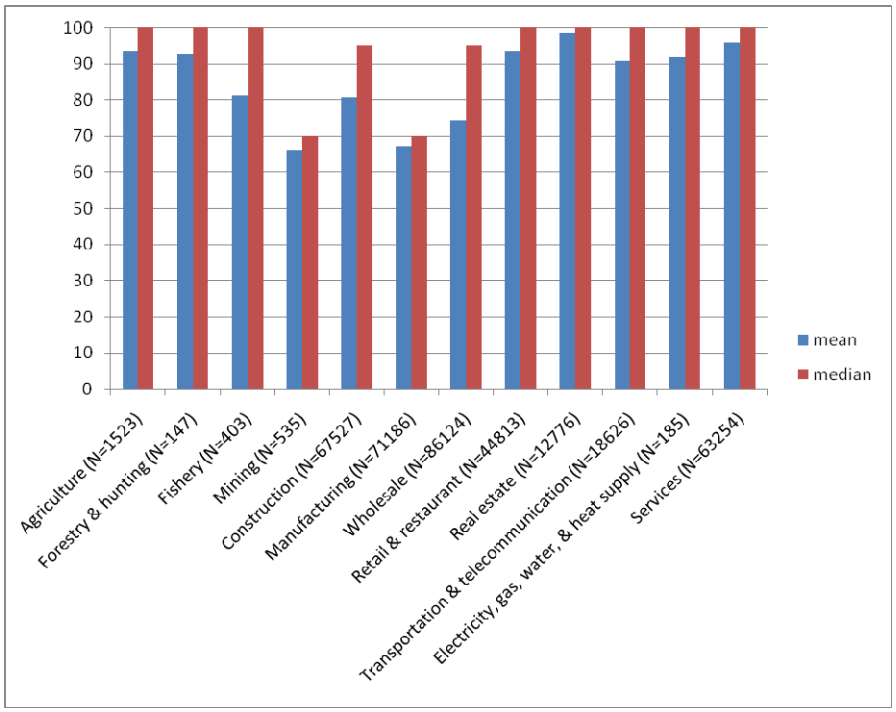
Promissory bills account for 14% of the payment. Excluding those firms that never use any bills and categorizing the remaining firms (N = 123,604) based on the fraction (for each 5% interval), promissory bills account for 6–10% of the payments for 10% of these firms, 16–20% for 10% of them, 26–30% for 11% of them, 46–50% for 12% of them, and 66–70% for 10% of them. The percentages for all the other categories are less than 10%. Thus, promissory bills are not necessarily used as the sole method of payment or as a minor method.

The other three methods of payment are rarely used. The fraction of each is less than 3%. We find that endorsement of other firms' promissory bills and setting-off are secondary methods of payment, because the fraction of each of these two methods is less than 20% for more than half of the firms that use them (N = 37,209 for endorsement and N = 8,749 for setting-off). In contrast, prepayment might be used as a dominant payment method when it is used. Out of 786 firms that use a non-zero fraction of prepayment, 11.96% of them

(N = 94) use prepayment only. However, another 53.31% (N = 419) use prepayment only less than 40%.

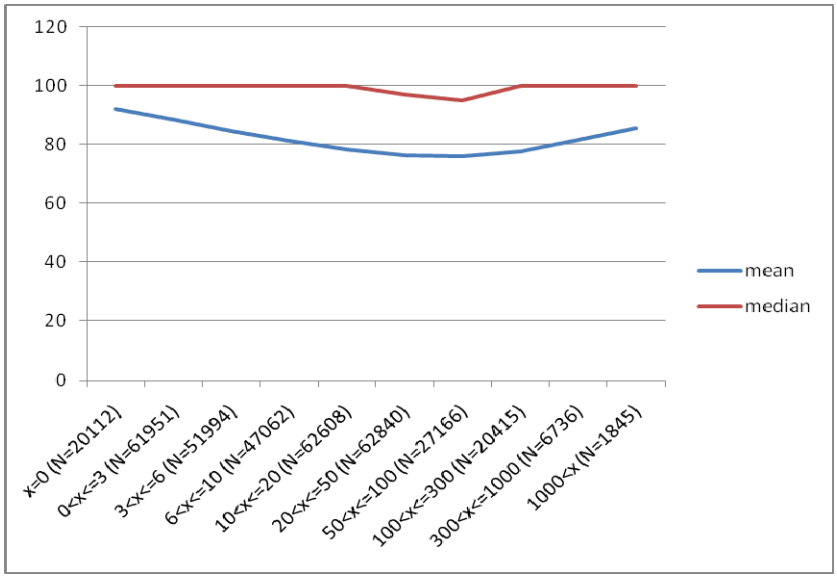
3.3.2. Univariate analysis (1): Cash

Figure 3-3. Cash payment ratio (%) by industry



We next check whether the use of a different method of payment differs depending on different firm characteristics. When broken down by industry (N = 367,100), the median cash ratio is 100% for most industries (see Figure 3-3). Exceptions are Mining (70%), Construction (95%), Manufacturing (70%), and Wholesale (95%). The mean ratios exhibit a similar pattern with Mining, Manufacturing, Wholesale, and Construction being the top four industries that do not use cash. In contrast, Real-estate firms depend greatly on cash.

Figure 3-4. Cash payment ratio (%) by firm size (x = the number of employees)

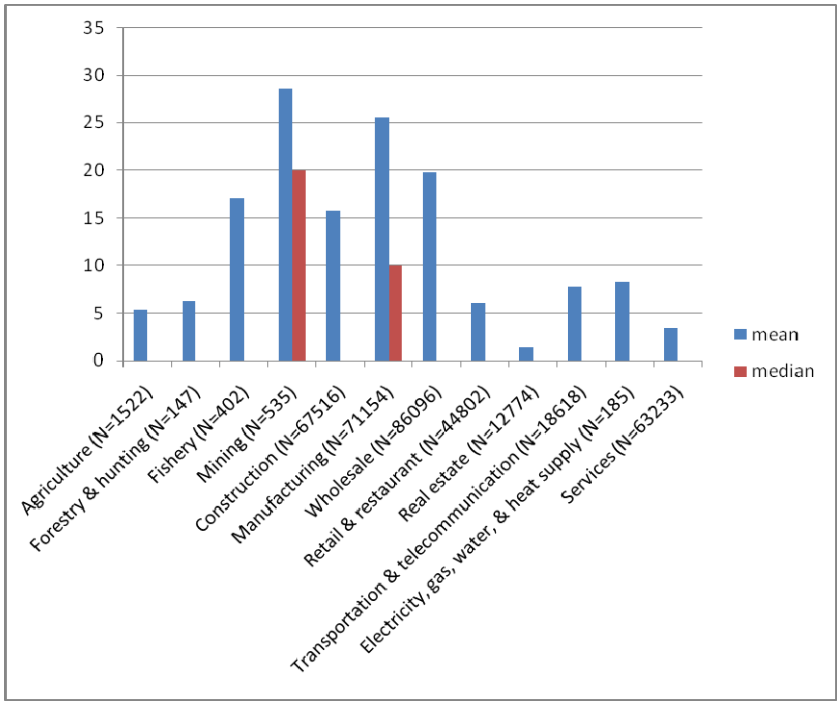


When interacted with firm size (the number of employees), the cash ratio exhibits a U-shape (N = 362,729). That is, large as well as small firms use more cash, but intermediate firms use less (e.g., mean = 76.2% and median = 95% for firms with 50–100 employees).

A similar U-shaped mean and a V-shaped median are also observed when the cash ratio is interacted with credit score (N = 362,168: firms rated between 60 and 65 use cash the least), capital asset ratio (N = 233,319: firms with 20–30% use the least), capital stock (N = 231,824: firms with capital stock of 20–50 million yen use the least), operating revenue (N = 162,166: firms with operating revenue of 300–500 million yen use the least), the number of suppliers (N = 321,638: firms with 100–300 suppliers use the least), and the interest bearing debt operating revenue ratio (N = 141,683: firms with ratio 5–8 use the least). When interacted with net current profit (N = 170,143), the cash ratio exhibits a W-shape and is higher for categories for the smallest losses, the largest losses, or the largest gains.

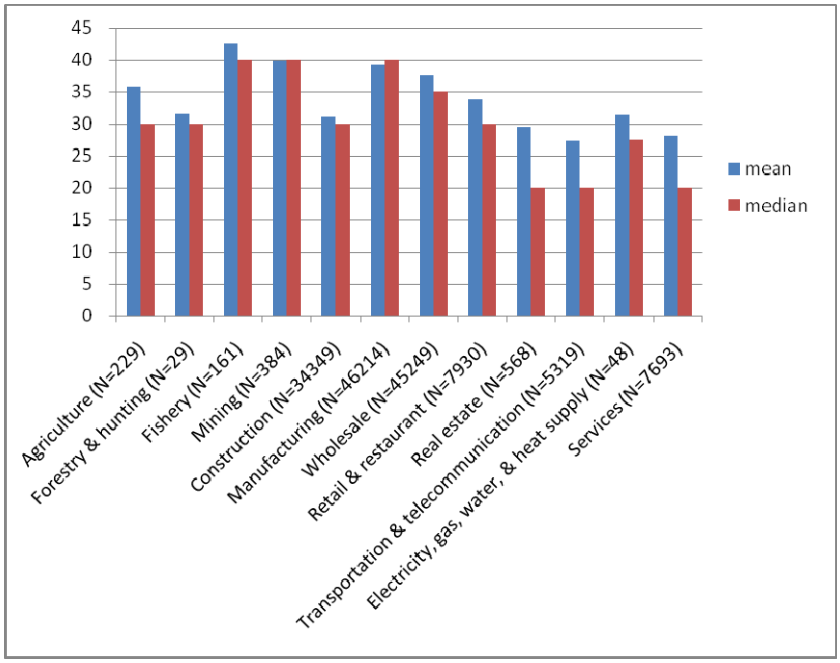
3.3.3. Univariate analysis (2): Promissory bills

Figure 3-5. Bill payment ratio (%) by industry



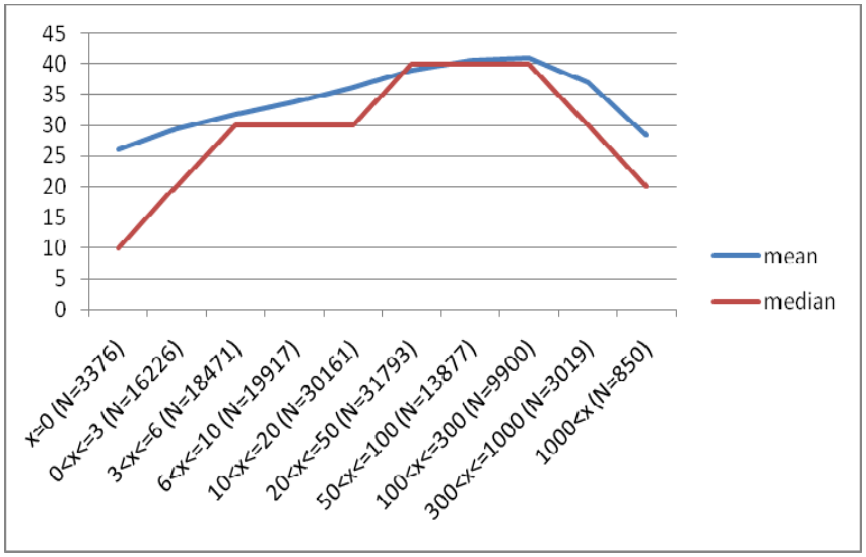
As the medians in Figure 3-5 show (N = 366,985), promissory bills are extensively used in Mining (20%) and Manufacturing (10%). In means, in addition to these industries (28.6% for Mining and 25.5% for Manufacturing), Wholesale (19.8%), Fishery (17.0%), and Construction (15.8%) use relatively more promissory bills. Small observations for Mining and Fishery should also be taken into account.

Figure 3-6. Bill payment ratio (%) by industry (excluding cash only firms)



If we exclude firms that make payment by cash only, the means and medians naturally increase (N = 148,173). Among those firms that use promissory bills, the bills are used for a non-negligible fraction of their payments. Real estate (N = 568), Transportation & telecommunication (N = 5,319), and Services (N = 7,693) are the top three induestirs that do not use promissory bills for payments. An investigation for such cross-industry differences would be an interesting future research topic.

Figure 3-7. Bill payment ratio (%) by firm size (x= # of employees) (excluding cash only firms)

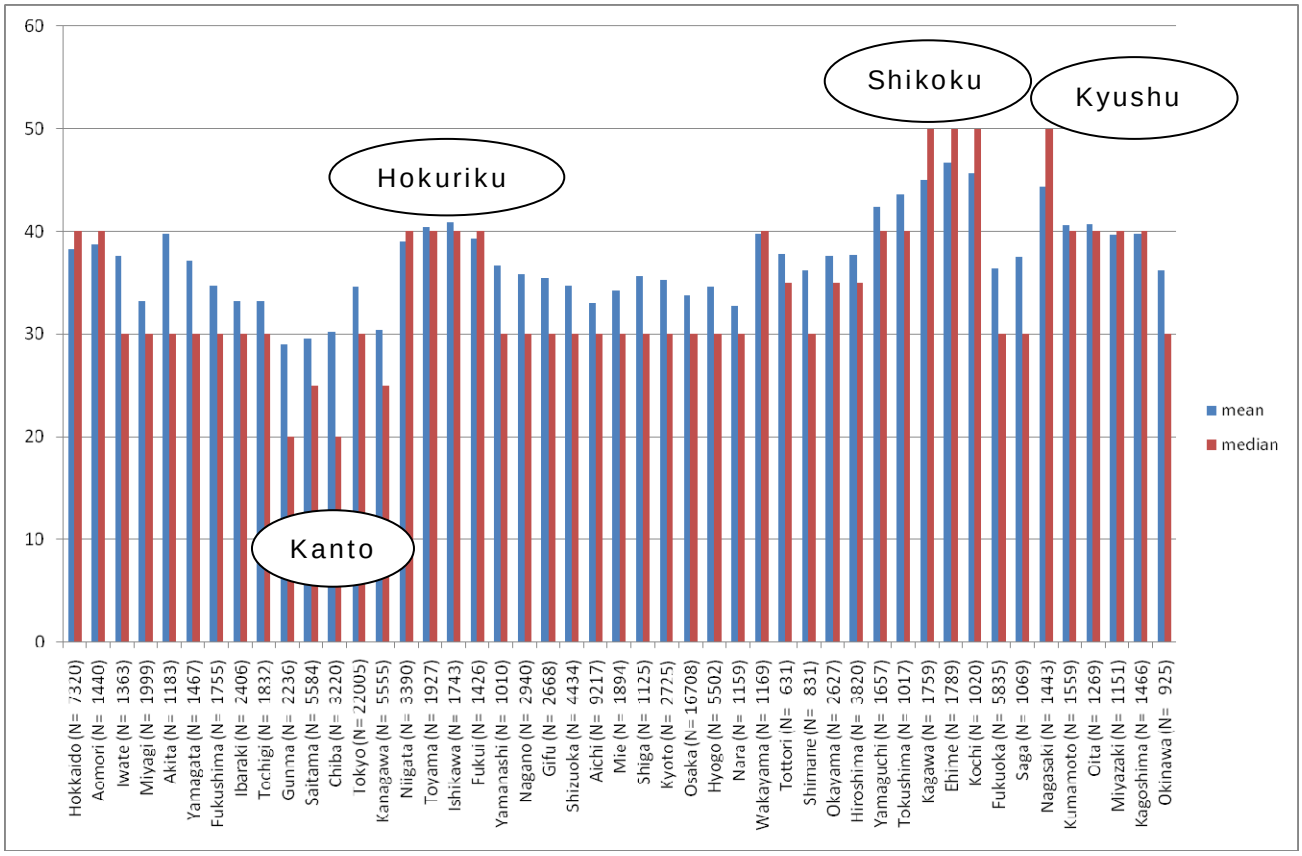


When interacted with other variables, the ratio of promissory bills exhibits an inverted U-shape, as shown in Figure 3-7, for the case when it is interacted with the number of employees (N = 147,590: cash only firms are excluded). A similar shape is observed when the cash ratio is interacted with the credit score (N = 147,466: firms rated between 60 and 65 use bills the most), capital asset ratio (N = 107,925: firms with 10–20% use the most), capital stock (N = 107,455: firms with capital stock of 100–200 million yen use the most), operating revenue (N = 80,470: firms with operating revenue of 3–5 billion yen use the most), the

number of suppliers (N = 141,919: firms with 100–300 suppliers use the most), and the interest bearing debt operating revenue ratio (N = 72,889: firms with ratio 8–10 use the most). However, when interacted with net current profit, the means and the medians are between 30–40% and no clear relationship exists.

The increasing part of the inverted U-shape indicates that a certain level of creditworthiness is needed for firms to be able to use promissory bills. The reason for this requirement might be because banks do not allow small firms to open a checking account to settle bills. The decreasing part of the inverted U-shape might reflect the greater availability of alternative financing sources for more creditworthy firms.

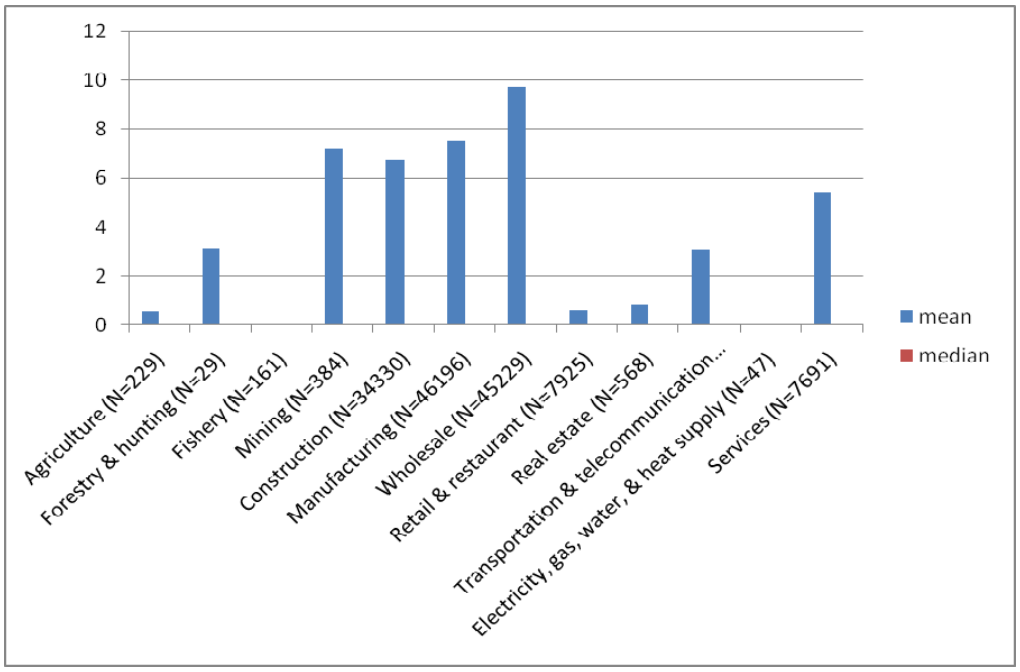
Figure 3-8. Bill payment ratio (%) by prefecture (excluding cash only firms)



We find some regional differences in the use of promissory bills (Figure 3-8: excluding cash only firms, N = 148,270). Firms in the Kanto area use relatively less bills, while those in Shikoku, Hokuriku, and Kyushu use more. Some of these differences might reflect the difference in the composition of industries. For example, prefectures in the southern Kanto area that include Chiba, Saitama, and Kanagawa have larger shares of non-manufacturing industries than other prefectures, which might well decrease the use of promissory bills. Note, however, that significant regional differences will probably remain even after controlling for the difference in the industry composition, which might be due to the differences in the degree of intra- vs. inter-area transactions.

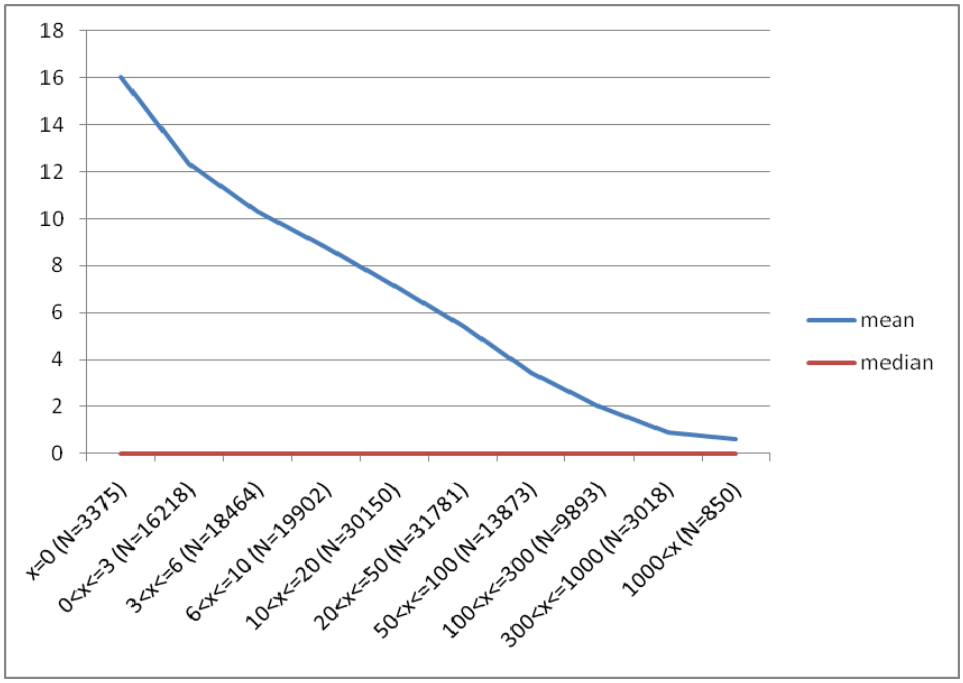
3.3.4. Univariate analysis (3): Bill endorsement

Figure 3-9. Bill endorsement ratio (%) by industry (excluding cash only firms)



We already find that payment by endorsing promissory bills is not a common method of payment. This is still the case even when we break down the sample firms depending on their industry, as zero medians for all the industries in the Figure 3-9 indicate (N = 148,105: cash only firms are excluded). However, in means, endorsements account for more than 5% of the payments for firms in Construction, Manufacturing, and Wholesale (Mining also, but the number of observation is small). Because these are the industries that also depend on promissory bills as a method of payment, this means that intra-industry trades are frequent for firms in these industries. In these industries, there are a small number of firms that use endorsement as a dominant method of payment.

Figure 3-10. Endorsement payment ratio (%) by firm size (x= # of employees) (excluding cash only firms)

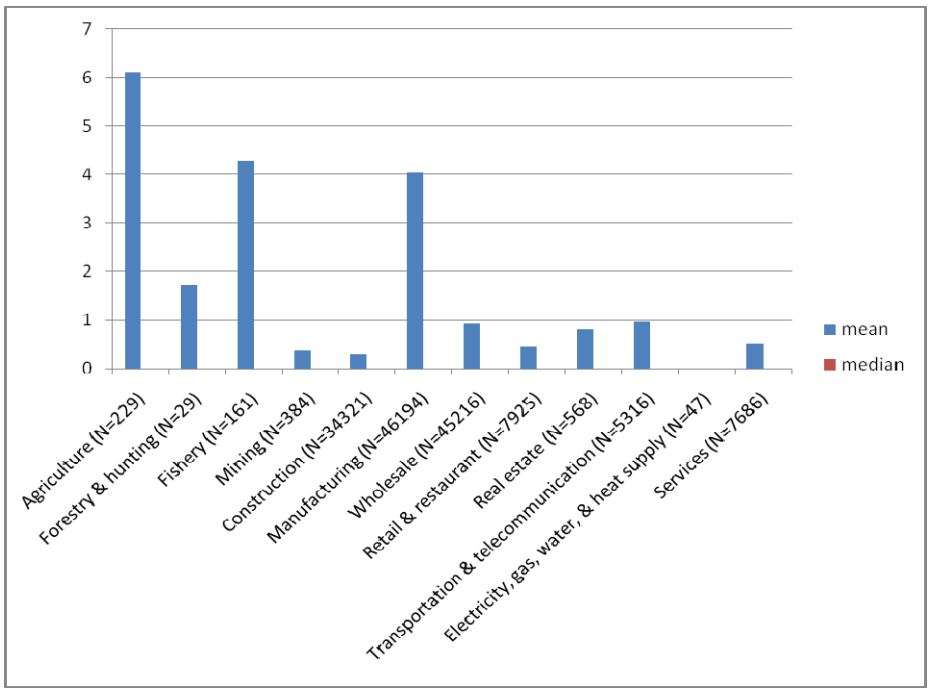


Endorsement is used by smaller and less creditworthy firms. As Figure 3-1- shows, the mean ratio is decreasing with the number of employees (N = 147,524). Similarly, it is decreasing with credit score (N = 147,401), capital stock (N = 107,401), the interest bearing debt operating revenue ratio (N = 141,603), and in the number of suppliers; at least when these variables are large, and non-increasing when they are small. However, no clear relationship exists when interacted with capital asset ratio and net current profit. The median ratio is always zero for all the categories of the base variables.

An interesting research question would be of when or for what characteristics of firms does bill endorsements help to improve their financial conditions. Our findings here imply that less creditworthy firms, which might find it difficult to issue their own bills, rely on bill endorsement.

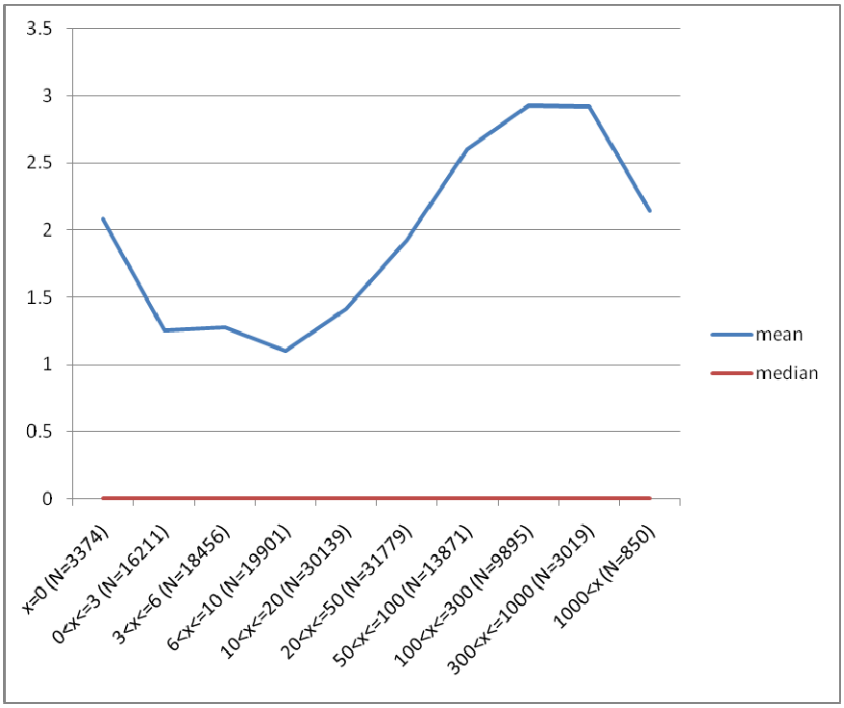
3.3.5. Univariate analysis (4): Setting-off

Figure 3-11. Setting-off payment ratio (%) by industry (excluding cash only firms)



Setting-off is also a minor method of payment. Even if the sample firms are categorized by their industries (N = 148,076, cash only firms are excluded), median ratios are zero. However, Agriculture (6.1%), Fishery (4.3%), and Manufacturing firms (4.0%) use setting-off relatively frequently. The number of observations for the first two of these industries are small, however.

Figure 3-12. Setting-off payment ratio (%) by firm size (x= # of employees) (excluding cash only firms)

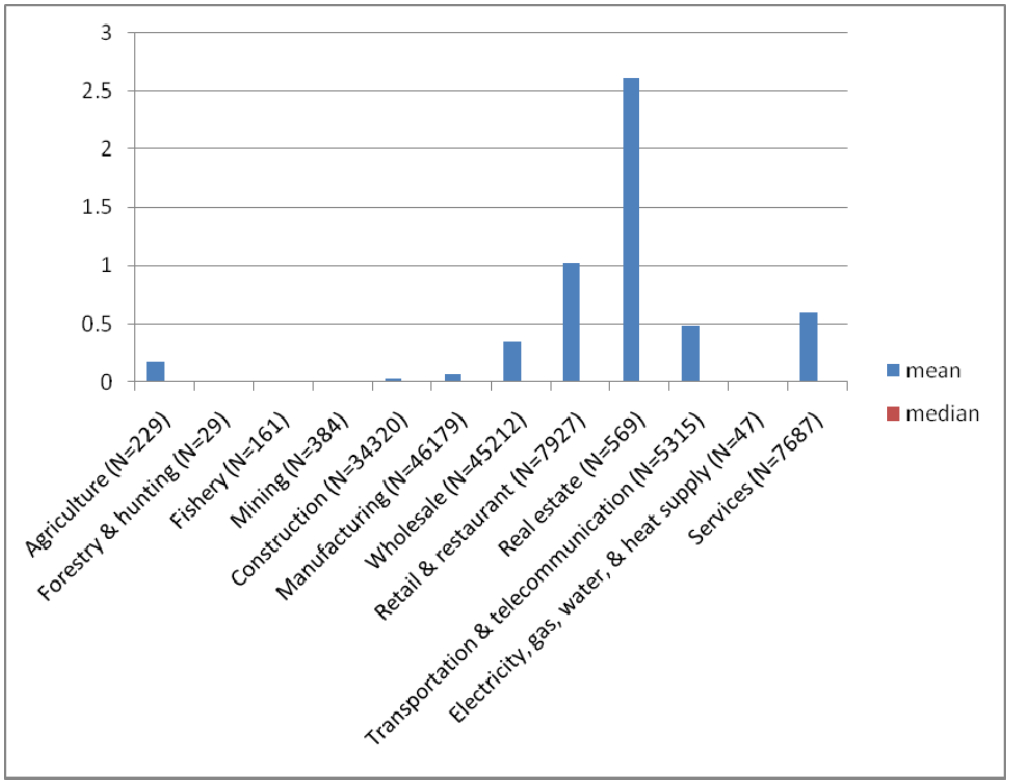


When interacted with other variables, the median ratios are zero for all the categories of the base

variables. As Figure 3-12 shows, the mean ratio exhibits a rotated-S shape in the number of employees (N = 147,495). This relationship might reflect the fact that, to use setting-off, firms must have transactions of sufficient size. A similar, but less clear rotated-S shape is observed with respect to credit score (N = 147,372) and to capital stock (N = 107,383). The mean ratio exhibits a U-shape with repect to net current profit (N = 83,878), is increasing with operating revenue (N = 80,412), and is decreasing with the interest bearing debt operating revenue ratio (N = 72,836) and in the number of suppliers (N = 141,829). No clear relationship exists with respect to the capital asset ratio (N = 107,852).

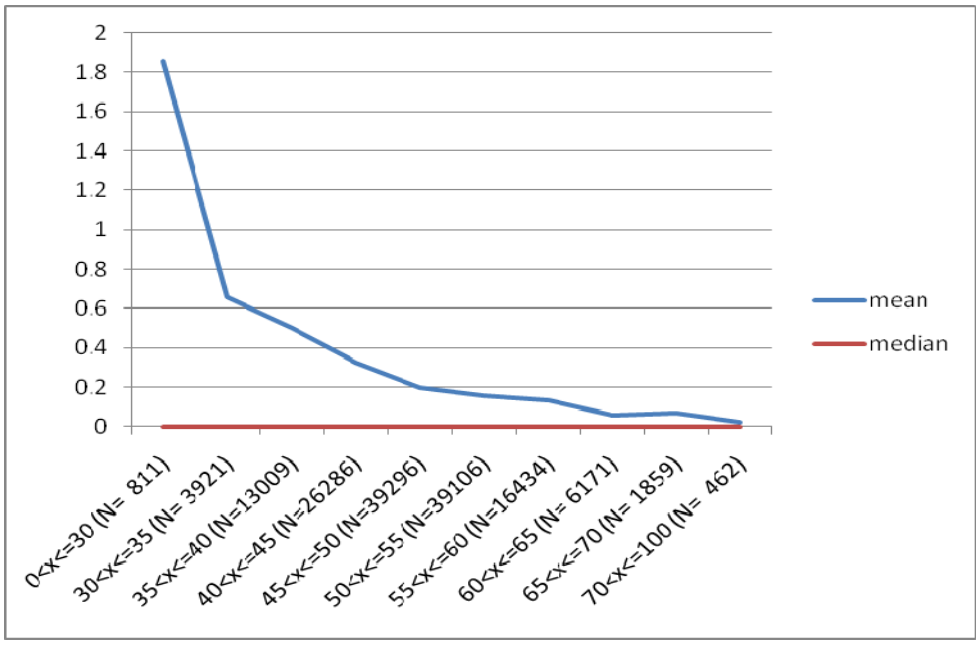
3.3.6. Univariate analysis (5): Prepayment

Figure 3-13. Prepayment ratio (%) by industry (excluding cash only firms)



Finally, prepayment is also a minor method of payment for all the industries as shown in zero medians in Figure 3-13 (N = 148,059: cash only firms are excluded). However, as mean figures show, Real-estate firms (2.6%) and Retail & restaurant firms (1.0%) use prepayment predominantly.

Figure 3-14. Prepayment ratio (%) by credit score (=x) (excluding cash only firms)



When interacted with other variables, the mean fraction of prepayment is decreasing with the number of employees (N = 147,478), credit score (N = 147,355: Figure 3-14), capital stock (N = 107,370), and operating revenue (N = 80,403), at a decreasing rate. This decrease means that small and less creditworthy firms tend to use prepayment. The mean ratio is also decreasing with the capital asset ratio except for those firms in the highest category (90–100%, N = 107,839). However, because it is Real-estate firms that tend to use prepayment frequently, these findings might alternatively imply that Real-estate firms using prepayment are small, less creditworthy, and have a high capital asset ratio. We find a less clear relationship between the prepayment ratio and net current profit, although the relationship looks like an inverted-U shape (N = 83,868). No clear relationship exists with respect to the interest bearing debt operating revenue ratio (N = 72,827). Median prepayment ratios are zero for all categories broken down by these variables.

3.4. Method of collection

3.4.1. Composition

In addition to payment methods, TDB also researches firms' methods of collection (receiving payments): fractions of collection made by (1) cash (including bank transfer, wire transfer, and checks), (2) promissory bills (including endorsed promissory bills), (3) setting-off (with trade payables), and/or (4) precollection.

The fraction of firms that use each collection method (for any non-zero amount of collection) is respectively 99.48% for cash (N = 368,898), 44.16% for promissory bills (N = 368,745), 2.33% for setting-off (N = 368,658), and 1.54% for precollection (N = 368,657). Similar to the case of payment, the most dominant method of collections is cash. We find that 54.43% of the firms use only cash when they make collections, which is slightly lower than the ratio of firms that use only cash when they make payments (59.74%). The number of firms that never use cash for collection is 1,906 (0.52%).

Table 3-5. Fraction of each method of collection

Method	N	mean	sd	min	p1	p50	p99	max
(1) Cash	368,898	84.281	24.180	0	10	100	100	100
(2) Promissory bills	368,745	14.434	22.852	0	0	0	90	100
(3) Setting-off	368,658	0.557	4.844	0	0	0	20	100
(4) Precollection	368,657	0.711	7.137	0	0	0	20	100

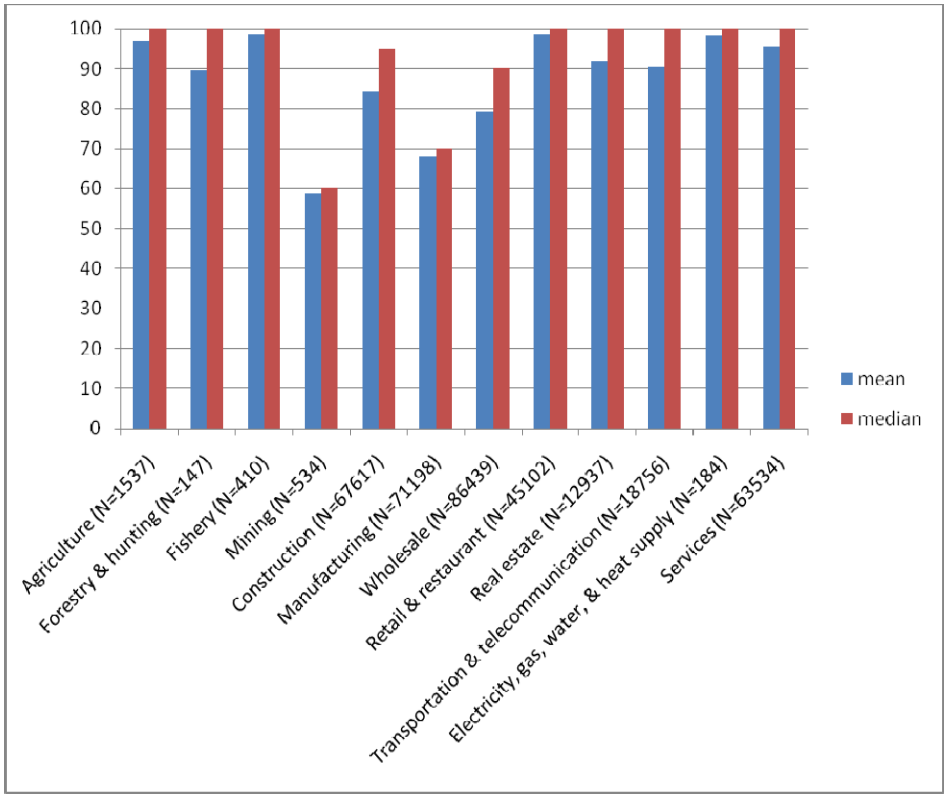
Table 3-5 shows the fraction of each collection method used in total collections. Similar to the case of payment, the most dominant method of collection is cash. The median firms never use other methods of collection. The mean cash collection ratio (84.3%) is slightly higher than the mean cash payment ratio (81.9%).

Promissory bills account for 14% of the payment (in mean). This fraction is comparable to the fraction of bills in total payments (14.36%). However, it should be noted that although endorsed bills are included here, writing out and endorsing new bills are separated in the statistics for payment (the mean ratio for payment by bill endorsement is 2.96%). Among those firms that use bills, the bills are in general secondary methods of payment. If we excude those firms that do not use them and categorize the remaining firms (N = 162,835) for each 5% interval, then more than half (59.7%) of these firm use promissory bills for less than 30% of their collections.

The other two collection methods are rarely used as shown by a fraction of less than 1%. We find that setting-off is a secondary method of collection. Even if we exclude firms that never collect by setting-off (N = 8,605), it accounts for only 15% or less of their total collections for more than half of those firms. However, precollection might be used as a dominant collection method. Although the precollection ratio is less than 30% for 54% of the firms that use a non-zero percent of precollection (N = 5,685), another 20% of these firms use precollection only. The mean precollection ratio (0.71%) is higher than the mean prepayment ratio (0.10%).

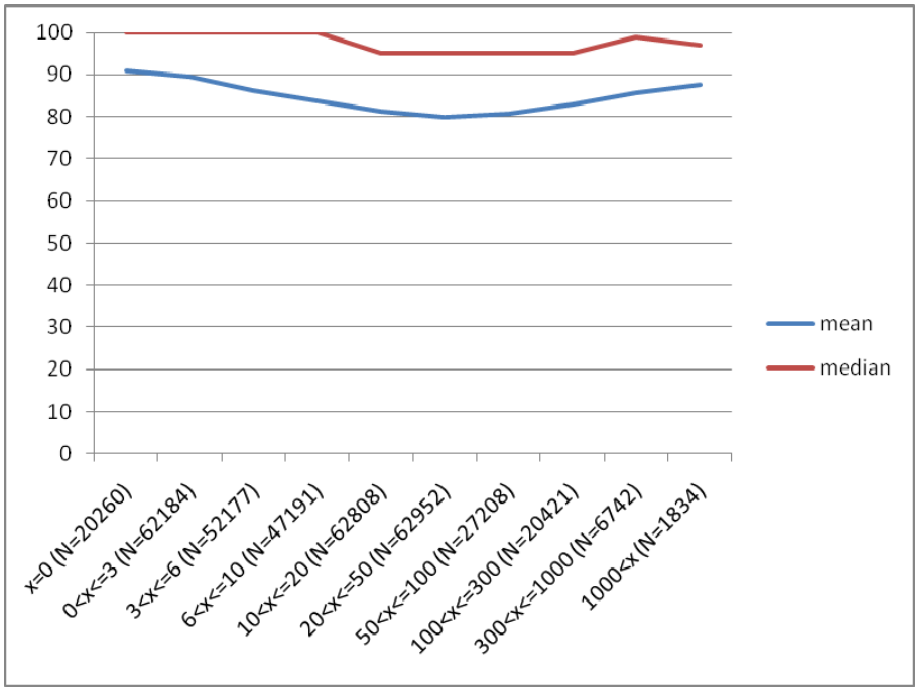
3.4.2. Univariate analysis (1): Cash

Figure 3-15. Cash collection ratio (%) by industry



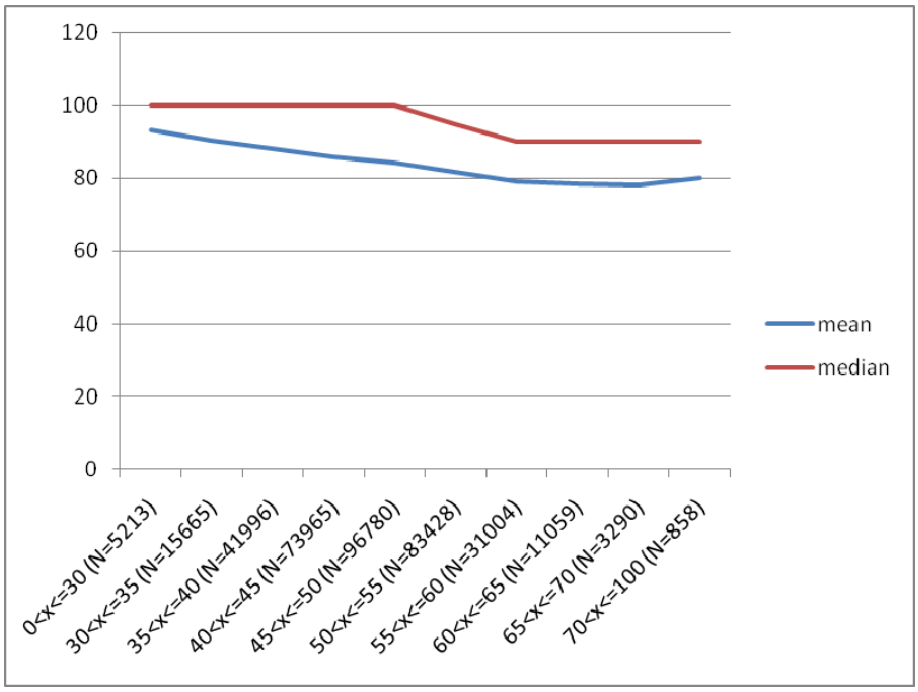
We now turn to analyse the difference in the ratios above by different firm characteristics. When broken down by industry (N = 368,396), the median cash collection ratio is 100% except for Mining (60%), Construction (95%), Manufacturing (70%), and Wholesale (90%). Mean ratios are also lower for these industries. In these respects the cash collection ratio exhibits similar characteristics to the cash payment ratio. In contrast, Retail & restaurant depend greatly on cash. As for Real-estate firms for which the cash payment ratio was the highest (98.5% in mean and 100% in median), the cash collection ratio is smaller and is 92.0%.

Figure 3-16. Cash collection ratio (%) by firm size (x= the number of employees)



When decomposed by firm size (the number of employees) (N = 363,777), the mean cash ratio exhibits a U-shape, with firms that hire 20–50 employees using cash the least (80.0%). A U-shaped relationship also exists when we interact the cash ratio with capital asset ratio (N = 233,811), capital stock (N = 232,307), the interest bearing debt operating revenue ratio (N = 141,823), and the number of customers (N = 239,566). The categories for which the cash collection ratio is lowest are: 30–40% of the capital asset ratio, 10–20 million yen of capital stock, 5–8 of the interest bearing debt operating revenue ratio, and 100–300 customers. As Figure 3-16 shows, the shape of the median cash ratio is similar to that of the mean ratio.

Figure 3-17. Cash collection ratio (%) by credit score (=x)



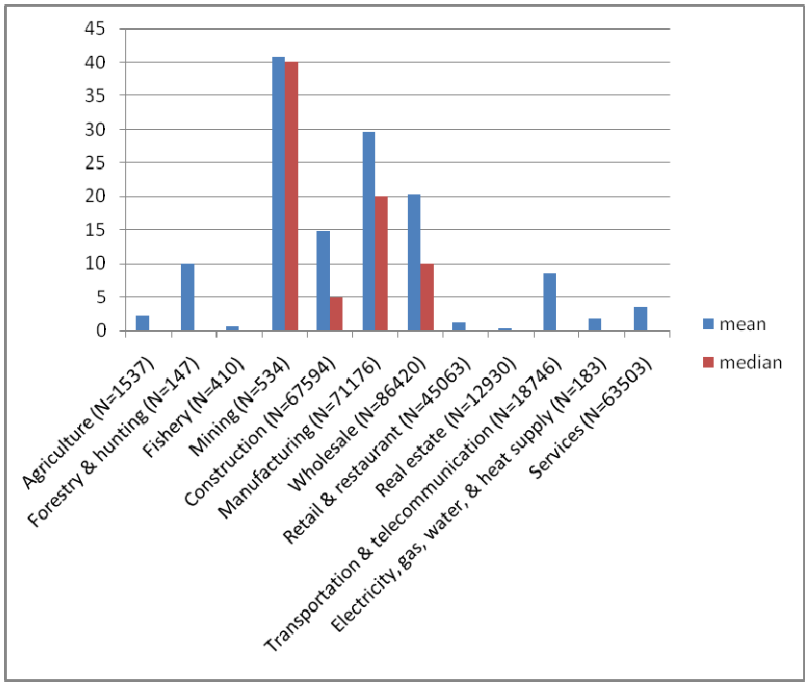
When interacted with credit score (N = 363,258), we find that the cash ratio is lower for highly rated firms (although the highest firms use cash slightly more extensively). A similar relationship exists when the sample firms are categorized by operating revenue (N = 162,345). The cash collection ratio is the lowest for the credit score category of 65–70 and for the operating revenue category of 3–5 billion yen.

When categorized by net current profit (N = 170,350), the mean cash ratio is W-shaped, i.e., it is higher around the zero-profit category, the highest (positive) category, and the lowest (negative) category. However, the median ratio exhibits an inverted-V shape. Again these characteristics of the cash collection ratio are in general similar to those of the cash payment ratio.

When these two ratios themselves are interacted with each other, they have an increased relationship (N = 364,968). The cash collection ratio is decreasing with the promissory bill payment ratio (N = 364,853), the bills endorsement ratio (N = 364,788), generally so the setting-off ratio (N = 364,758). Its mean is also decreasing with the prepayment ratio (N = 364,743). These findings seem to indicate that firms tend to make payments using methods that they use for their collections. However, other findings suggest that cash is a dominant method of collection. First, even when the other methods are used for payment, the cash collection ratio is high (e.g., the median cash collection ratio is 75% for 100% bill firms and is 30% for 100% setting-off firms). Also, the median is 100% for most of the categories broken down by the prepayment ratio.

3.4.3. Univariate analysis (2): Promissory bills

Figure 3-18. Bill collection ratio (%) by industry



As the medians in Figure 3-18 show (N = 368,244), promissory bills (for collection) are extensively used in Mining (40%), Manufacturing (20%), Wholesale (10%), and Construction (5%). For these four industries, the median bill collection ratio is greater than the median bill payment ratio, so firms in these industries collect more bills than they use. As means show, Forestry & hunting (10.0%) and Transportation &

telecommunication (8.5%) also use promissory bills to some extent, although the number of observations for Forestry & hunting is small.

Figure 3-19. Bill collection ratio (%) by industry (excluding cash only firms)

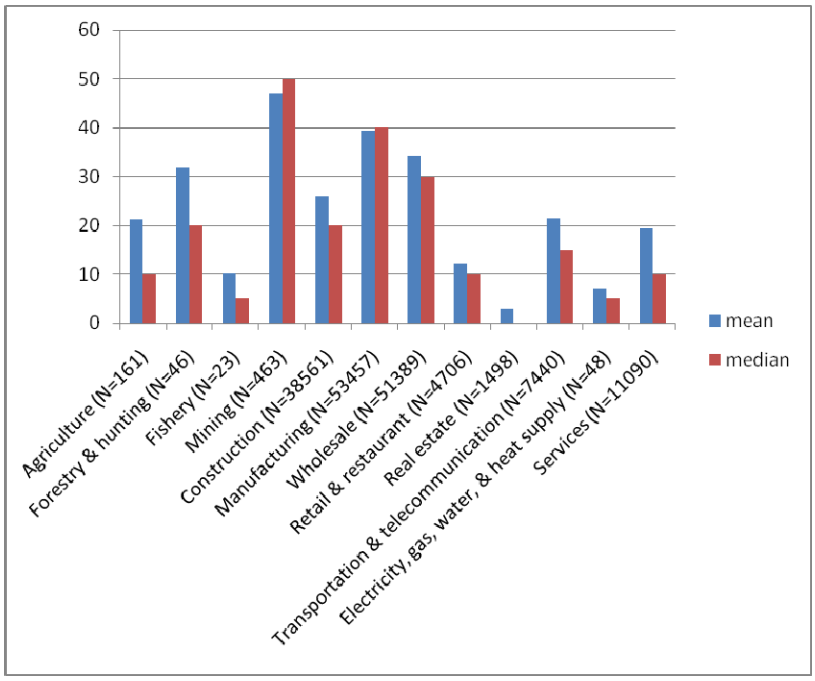
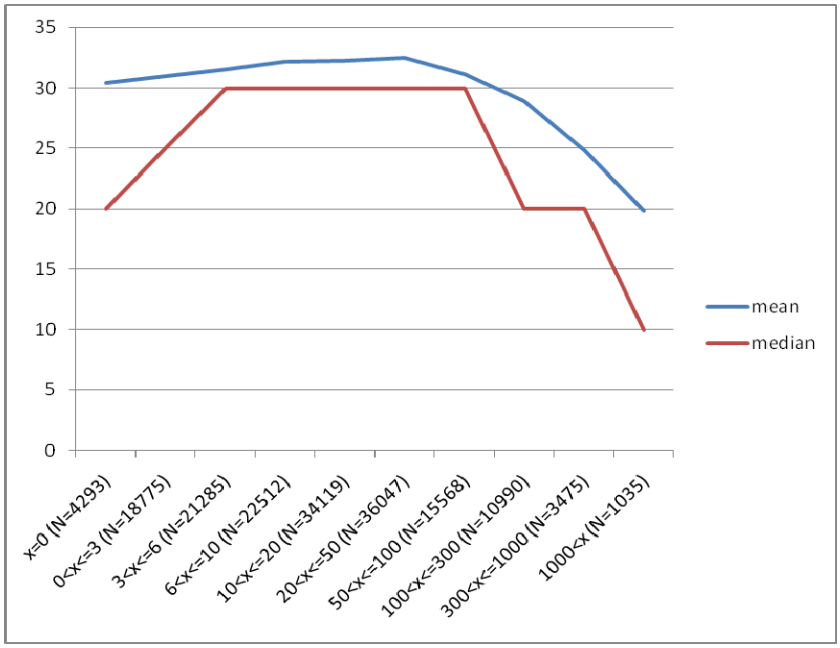


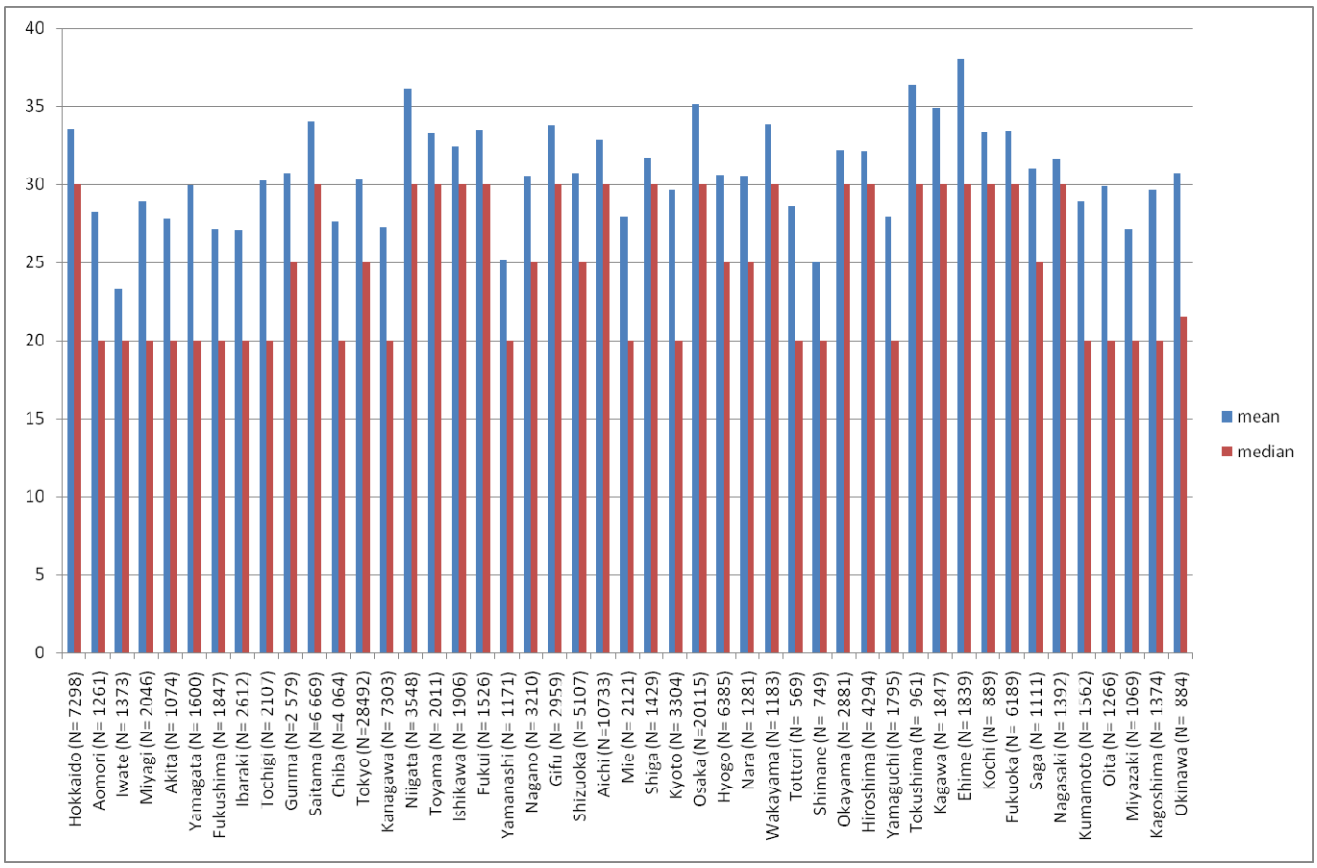
Figure 3-19 shows the mean and the median bill collection ratio when we exclude firms that make collection by cash only (N = 168,882). We have already found that the mean and median bills payment ratios are around 20–40% for each industry when we exclude cash only firms. The mean and the median bill collection ratios shown in the figure are thus smaller in most industries, which indicates that when they are used, promissory bills are more frequently used as a method of payment than as a method of collection. However, note that the number of excluded firms (i.e., cash only firms) differ in the case of payment and collection.

Figure 3-20. Bill collection ratio (%) by firm size (x = # of employees) (excluding cash only firms)



When interacted with other variables, the ratio of promissory bills has an inverted U-shape when interacted with the number of employees (Figure 3-19: cash only firms are excluded, N = 168,099). Promissory bills are most extensively used by firms hiring 20–50 employees. A similarly inverted shape is observed when the ratio is interacted with credit score (N = 167,921: firms rated between 40 and 45 use bills the most), capital asset ratio (N = 123,320: firms with 10–20% use the most), capital stock (N = 122,795: firms with capital stock of 5–10 million yen use the most), operating revenue (N = 91,932: firms with operating revenue of 3–5 billion yen use the most), and the interest bearing debt operating revenue ratio (N = 82,899: firms with ratio 5–8 use the most). When interacted with net current profit, the means and the medians are between 20–30% and no clear relationship exists. These characteristics are similar to those we observed with respect to the bill payment ratio.

Figure 3-21. Bill collection ratio (%) by prefecture (excluding cash only firms)



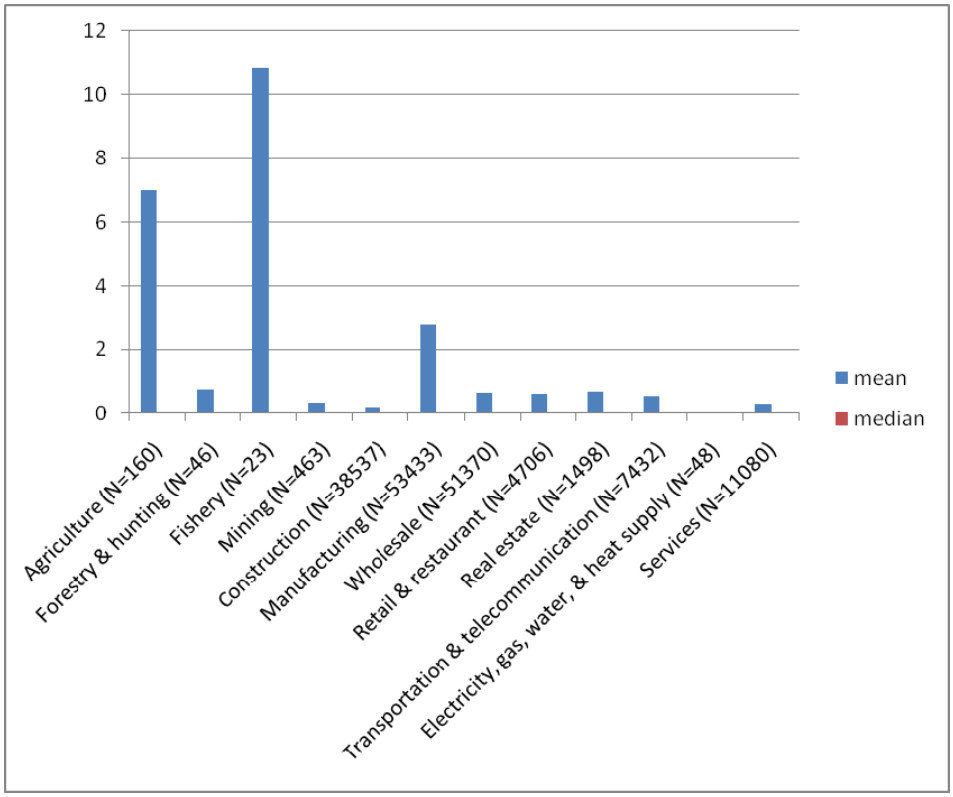
Compared with the bills payment ratio, we see less dispersion and smaller levels for the means and medians of the bill collection ratio across prefectures (Figure 3-20: N = 168,985). We have already found that promissory bills are extensively used for payment in the Hokuriku, Shikoku, and Kyushu areas and less extensively used in the Kanto area. Similar tendencies also exist in this figure, but less clearly.

The bill collection ratio is decreasing with the cash payment ratio (N = 168,075), the setting-off payment ratio (N = 167,934), and the prepayment ratio (N = 167,916), but it is increasing with the bill payment ratio (N = 168,011) and the bill endorsement ratio (N = 167,964). These relationships again suggest a correlation between the method of payment and the method of collection.

When we decompose sample firms, depending on whether firms have banks discount any bills or not, those that do use promissory bills for 44.1% (in mean) or 40% (in median) of the total collections, and those that do not use them for 13.3% (in mean) or zero (in median) of the collections. The mean and the median bill collection ratios are also increasing with the amount of bills discounted by banks. Thus, firms that have banks discount bills collect more by bills, or those that collect more by bills have banks discount them more frequently, although the number of observations for this decomposition is small (N = 57,167).

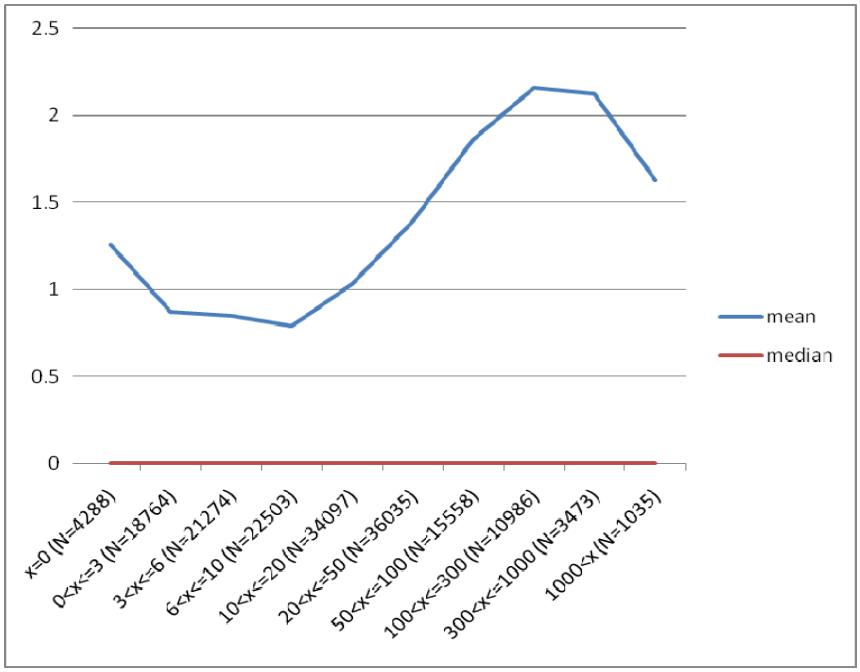
3.4.4. Univariate analysis (3): Setting-off

Figure 3-22. Setting-off collection ratio (%) by industry (excluding cash only firms)



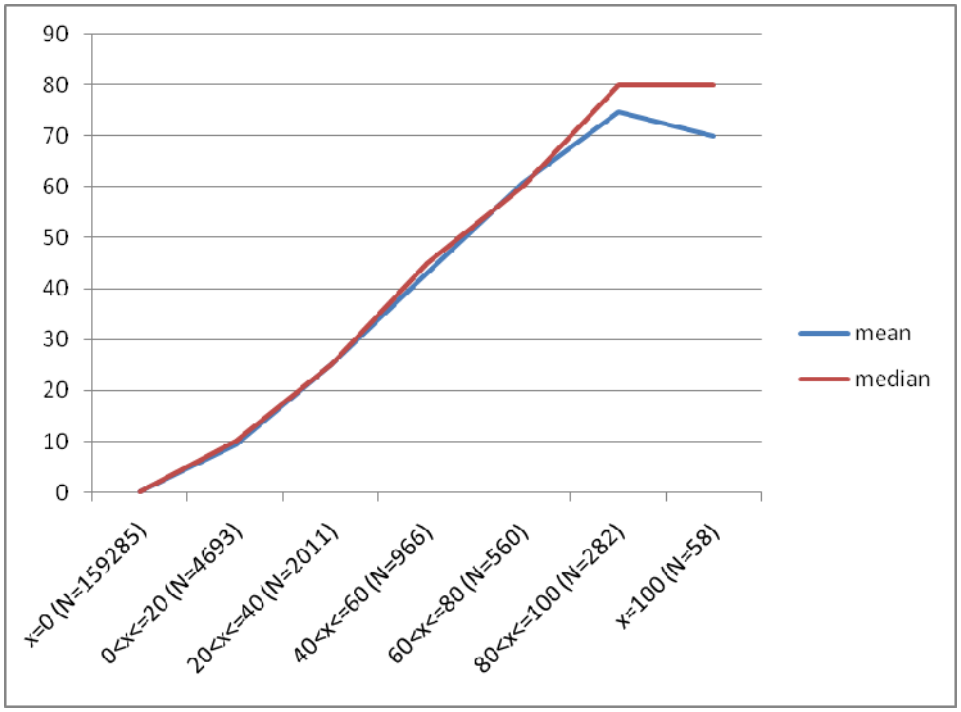
When we calculate the mean and the median of the setting-off collection ratio by industry (N = 168,796), the medians are zero for all the industries, which implies that setting-off is never extensively used in any industries. In means, Fishery (10.9%), Agriculture (7.0%), and Manufacturing (2.8%) firms use relatively more setting-off for collection. As we found earlier, these are also industries that use setting-off for payment. However, the first two of these industries have very few observations.

Figure 3-23. Setting-off collection ratio (%) by firm size (x= # of employees) (excluding cash only firms)



When interacted with other variables, the median ratios are zero for all the broken-down categories. As Figure 3-23 shows, the mean ratios for different categories of the number of employees exhibits a rotated-S shape as in the case of the setting-off payment ratio (N = 168,013: cash only firms are excluded). Similarly, a less clear rotated-S shape is observed with respect to credit score (N = 167,837: no cash only firms) and to capital stock (N = 122,733: no cash only firms). The mean ratio exhibits a U-shape with repect to net current profit (N = 95,615: no cash only firms), is increasing with operating revenue (N = 87,486: no cash only firms); and is decreasing with the capital asset ratio (N=123,257: no cash only firms), the interest bearing debt operating revenue ratio (N = 82,864: no cash only firms), and in the number of suppliers (N = 142,688: no cash only firms).

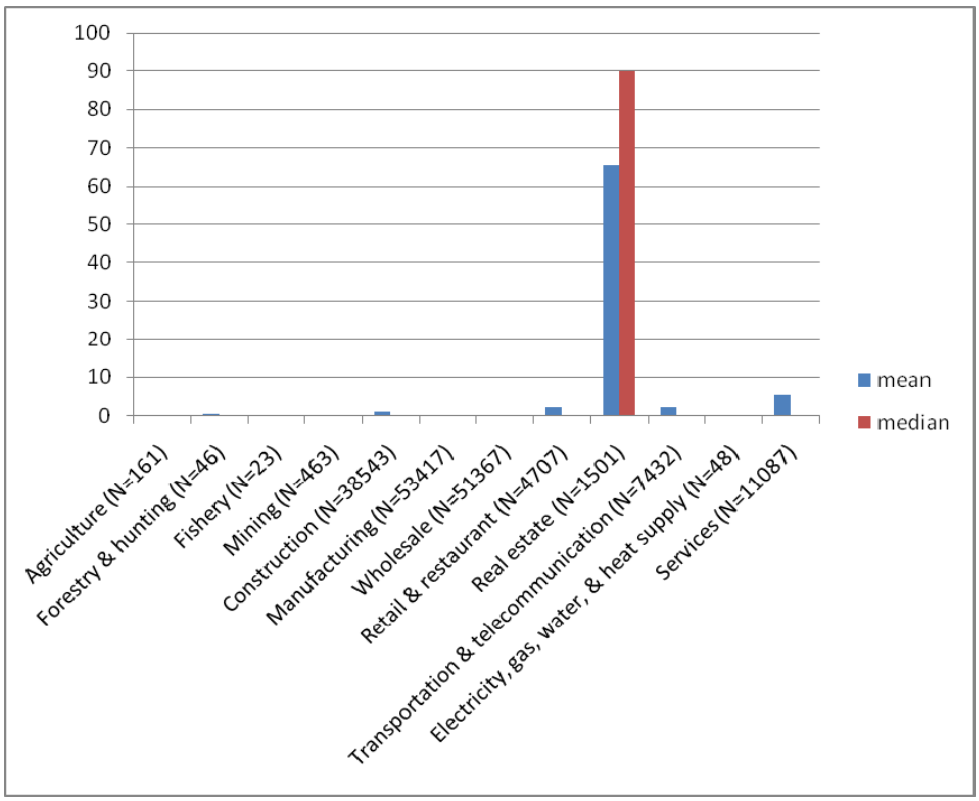
Figure 3-24. Setting-off collection ratio by setting-off payment ratio (=x) (excluding cash only firms)



We also find that the mean setting-off collection ratio is decreasing with the cash payment ratio (N = 167,993: no cash only firms) at a decreasing rate, and the bill endorsement ratio (N = 167,885: no cash only firms) is generally decreasing with the bill payment ratio (N = 167,929: no cash only firms). However, the mean setting-off collection ratio is increasing with the setting-off payment ratio (N = 167,855: no cash only firms). No clear relationship exists with respect to the prepayment ratio (N = 167,837: no cash only firms).

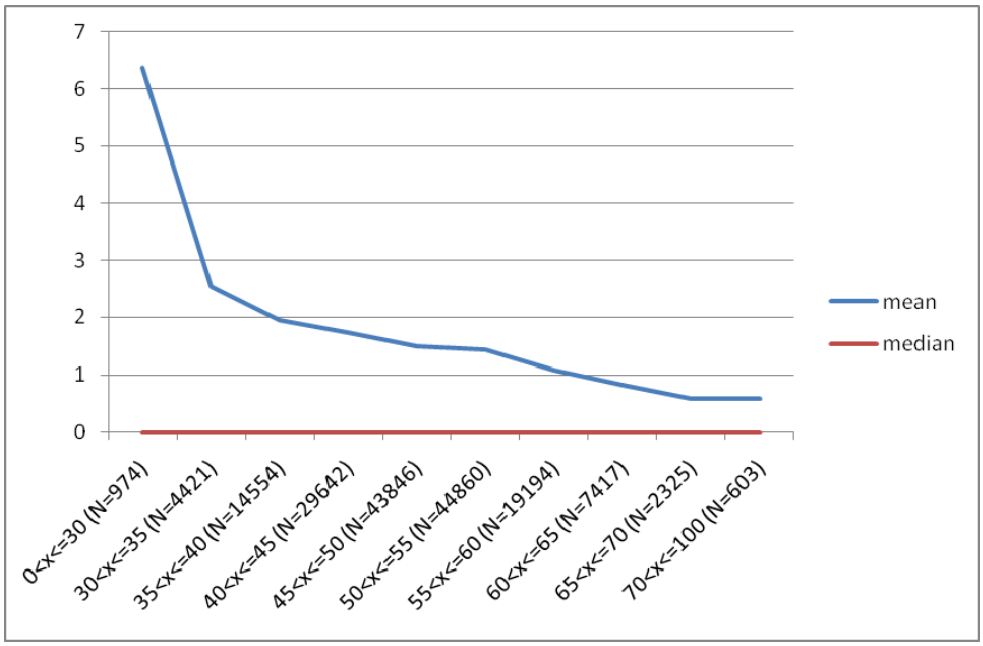
3.4.5. Univariate analysis (4): Precollection

Figure 3-25. Precollection ratio (%) by industry (excluding cash only firms)



When broken down by industry (N = 168,795: cash only firms are excluded), we clearly find that precollection is a collection method for Real-estate firms (Figure 3-25). More than half of the firms use precollection for 90% of their total collections. We observed earlier that Real-estate firms use prepayment relatively frequently, but its mean and median were respectively 2.6% and zero. Prepayment and precollection are not necessarily simultaneously used. A possible reason for this asymmetry is that Real-estate firms make payments for firms, but collect from retail customers.

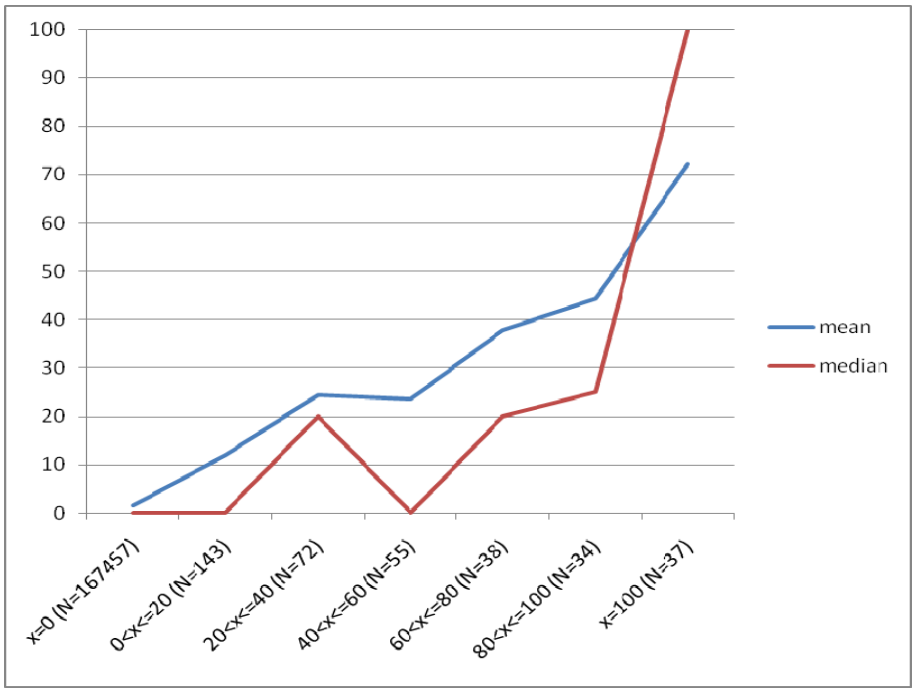
Figure 3-26. Precollection ratio (%) by credit score (=x) (excluding cash only firms)



Even eliminating those firms that collect by cash only, the median precollection rate is zero for all the categories broken down by other variables. The mean ratio is decreasing at a decreasing rate with the number of employees (N = 168,012), credit score (N = 167,836: shown in Figure 3-25), operating revenue (N = 91,892), and the number of customers (N = 142,676). We thus find that small and less creditworthy firms tend to use prepayment. The mean ratio is U-shaped with respect to the capital asset ratio (N = 123,260) and is less clearly so to the interest bearing debt operating revenue ratio (N = 82,867). No clear relationship exists when interacted with capital stock and net current profit.

When interacted with the cash payment ratio (N = 167,992: excluding cash only firms), the mean precollection ratio is the highest (4.73%) for firms paying with 100% cash (N = 44,952). Firms never paying with cash also use precollection (5.9%), but the number of observations is small (N = 467). The mean precollection rate is less than 1% for the other intermediate categories. The precollection ratio is also higher (3.26%) for firms using no promissory bills (3.3% for 68,942 such firms: N = 167,928 (excluding cash only firms)), no bill endorsement (1.9%, for 130,891 such firms: N = 167,885 (excluding cash only firms)), or no setting-off (1.6% for 159,305 such firms: N = 167,855 (excluding cash only firms)) for payment. However, the mean for other categories broken down by the bill payment ratio, the bill endorsement ratio, or the setting-off payment ratio are all less than 0.5%, and the median is zero for all the categories. Finally, the precollection ratio is increasing with the prepayment ratio (N = 167,836) at an increasing rate (Figure 3-27), although the majority of firms use neither prepayment nor precollection.

Figure 3-27. Precollection ratio (%) by prepayment ratio (=x) (excluding cash only firms)



3.5. Trade credit days

3.5.1. Closing day

We now do an overview of trade credit days. As explained in Subsection 3.2, there are several important

days for processing trade credit. We now present statistics for these days. This overview also helps us to grasp the length of the credit period, which will be focused on in the next subsection.

First, with respect to a closing day, two different pieces of information are available from TDB: their *primary* method of payment and their *secondary* one (if any). The data show that almost all the sample firms have a closing day in each month: 99.84% of them have a closing day for their primary method of payment (N = 337,868) and 99.60% have one for their secondary method of payment (N = 46,290).

Note, for reference, a survey conducted in 2008 by the Research Institute of Economy, Trade, and Industry, for a sample of over 5,700 firms that were mostly small- and medium-sized enterprises, found that a smaller percentage (90.3%) had a closing day (see Uesugi et al. 2009). The major difference between our sample firms and those in this survey is that the survey asks responding firms about the primary payment to their *main* suppliers. The difference might also stem from the smaller size of the firms in the TDB database.

We also find that the closing day is almost always set within the month when the transaction was made. The number of firms that set it in another month (e.g., in the next month) is only 16 (out of 337,184 firms) for the primary payment and 24 (out of 472,662 firms) for the secondary payment. These exceptions are not specific to a particular region or industry.

Table 3-6. Date of the monthly closing day

Primary payment method			Secondary payment method		
date in a month	freq.	%	date in a month	freq.	%
5 th	427	0.13	5	102	0.22
10 th	2576	0.76	10	548	1.19
15 th	6808	2.02	15	1684	3.66
20 th	88928	26.39	20	12493	27.14
25 th	7566	2.24	25	1268	2.76
30 th	632	0.19	30	140	0.30
31st	229790	68.18	31	29700	64.53
Others	306	0.09	Others	89	0.20
Total	337033	100	Total	46024	100

As shown in Table 3-6, the majority of firms (68.2%) set a closing day for the 31st (end of month) of each month, while many others set one for the 20th (26.39%) (for the primary payment method). Dates other than these two are relatively infrequent. Among them, the 25th (2.24%) and the 15th (2.02%) are the next most used, followed by the 10th (0.76%), the 30th (0.19%), and the 5th (0.13%). Similar relationships exist with respect to firms' secondary payment method, although the distribution is slightly dispersed.

Table 3-7. Closing day date (=x) by prefecture (primary payment method)

pref.	x=5th	x=10 th	x=15 th	x=20 th	x=25 th	x=31st	Others	total
Hokkaido	0.09%	0.44%	0.85%	26.17%	1.92%	70.41%	0.12%	100%
Aomori	0.11%	0.36%	1.39%	23.32%	1.61%	73.14%	0.07%	100%
Iwate	0.15%	0.49%	0.65%	17.43%	2.02%	79.03%	0.23%	100%
Miyagi	0.15%	0.67%	1.11%	16.36%	1.94%	79.67%	0.10%	100%
Akita	0.00%	0.51%	1.80%	25.96%	2.14%	69.20%	0.39%	100%
Yamagata	0.24%	0.68%	1.32%	26.62%	2.04%	68.87%	0.23%	100%
Fukushima	0.05%	0.34%	0.80%	16.27%	2.06%	80.33%	0.15%	100%
Ibaraki	0.21%	0.68%	1.41%	17.54%	2.09%	77.97%	0.10%	100%
Tochigi	0.15%	0.76%	1.11%	17.88%	2.64%	77.26%	0.20%	100%
Gunma	0.16%	0.82%	1.47%	25.07%	3.90%	68.38%	0.20%	100%
Saitama	0.16%	0.94%	1.77%	23.81%	2.60%	70.53%	0.19%	100%
Chiba	0.13%	1.03%	1.85%	20.61%	2.38%	73.91%	0.09%	100%
Tokyo	0.17%	1.00%	2.12%	21.35%	1.44%	73.47%	0.45%	100%
Kanagawa	0.11%	0.70%	1.66%	17.73%	2.35%	76.88%	0.57%	100%
Niigata	0.07%	0.67%	2.07%	**45.95%**	3.90%	**47.17%**	0.17%	100%
Toyama	0.07%	0.66%	1.56%	**50.35%**	3.15%	**44.11%**	0.10%	100%
Ishikawa	0.06%	0.28%	1.52%	**46.34%**	4.28%	**47.34%**	0.18%	100%
Fukui	0.00%	0.61%	1.67%	**51.45%**	7.62%	**38.44%**	0.21%	100%
Yamanashi	0.04%	0.50%	1.40%	18.94%	4.75%	74.21%	0.16%	100%
Nagano	0.13%	0.84%	1.30%	29.78%	3.12%	64.56%	0.27%	100%
Gifu	0.06%	0.59%	1.78%	**43.92%**	4.30%	**49.15%**	0.20%	100%
Shizuoka	0.08%	0.52%	1.17%	22.92%	3.59%	71.61%	0.11%	100%
Aichi	0.13%	0.76%	1.81%	31.03%	1.94%	64.19%	0.14%	100%
Mie	0.11%	1.13%	2.48%	34.82%	2.93%	58.43%	0.10%	100%
Shiga	0.08%	0.61%	3.37%	**50.57%**	1.83%	**43.43%**	0.11%	100%
Kyoto	0.09%	0.95%	4.02%	**47.43%**	2.25%	**45.05%**	0.21%	100%
Osaka	0.17%	1.10%	4.78%	**41.68%**	1.28%	50.55%	0.44%	100%
Hyogo	0.11%	0.82%	2.52%	38.89%	2.15%	55.21%	0.30%	100%
Nara	0.04%	0.41%	2.77%	**44.50%**	1.86%	50.33%	0.09%	100%
Wakayama	0.00%	0.60%	1.29%	**43.13%**	4.74%	**49.70%**	0.54%	100%
Tottori	0.17%	0.86%	2.84%	34.17%	3.36%	58.35%	0.25%	100%
Shimane	0.07%	0.79%	1.12%	**41.41%**	3.42%	53.00%	0.19%	100%
Okayama	0.10%	0.39%	1.39%	18.97%	4.10%	74.99%	0.06%	100%
Hiroshima	0.08%	0.52%	1.44%	20.12%	3.40%	74.34%	0.10%	100%
Yamaguchi	0.00%	0.25%	0.95%	14.88%	2.47%	81.41%	0.04%	100%
Tokushima	0.16%	0.47%	1.41%	21.48%	3.92%	72.09%	0.47%	100%

Kagawa	0.24%	0.42%	1.78%	28.15%	5.61%	63.69%	0.11%	100%
Ehime	0.09%	0.35%	0.92%	20.22%	4.14%	74.09%	0.19%	100%
Kochi	0.11%	0.54%	0.81%	17.99%	2.76%	76.86%	0.93%	100%
Fukuoka	0.05%	0.63%	1.14%	12.87%	1.53%	83.60%	0.18%	100%
Saga	0.16%	0.52%	1.09%	12.86%	1.82%	83.56%	0.00%	100%
Nagasaki	0.07%	0.24%	1.11%	**9.97%**	2.29%	86.15%	0.17%	100%
Kumamoto	0.08%	0.46%	1.09%	13.31%	2.01%	82.91%	0.14%	100%
Oita	0.07%	0.22%	0.85%	10.91%	1.74%	86.16%	0.05%	100%
Miyazaki	0.07%	0.33%	1.26%	**9.67%**	1.26%	87.11%	0.30%	100%
Kagoshima	0.09%	0.34%	0.71%	**8.28%**	1.24%	89.30%	0.04%	100%
Okinawa	0.04%	0.32%	0.64%	**3.50%**	0.67%	94.49%	0.34%	100%

Table 3-7 shows the distribution of the closing day date in a month for the primary payment method depending on firms' prefecture (N=337,037). Firms in southern Japan (those in Kyushu island and Okinawa) tend to set a closing day at the end of the month, while those in central Japan (especially those in Hokuriku region) frequently set a closing day on the 20th. We find similar, but less clear, regional differences for a closing day for the secondary payment method. We have already found similar regional differences in the use of promissory bills. These findings might indicate that commercial transactions in these areas are clustered. It might be interesting to investigate whether, and how, this pattern reflects historical background as well.

Table 3-8. Closing day date (=x) by industry(primary payment method)

Industry	x=5th	x=10th	x=15th	x=20 th	x=25th	x=31st	Others	total
Agriculture	0.00%	0.53%	0.83%	6.70%	1.20%	**90.52%**	0.23%	100%
Forestry & hunting	0.00%	0.00%	1.75%	6.14%	0.88%	**91.23%**	0.00%	100%
Fishery	0.00%	0.00%	0.00%	5.42%	1.81%	**92.47%**	0.30%	100%
Mining	0.00%	0.20%	0.20%	13.32%	2.98%	**83.30%**	0.00%	100%
Construction	0.28%	1.37%	2.14%	**28.27%**	4.41%	63.30%	0.22%	100%
Manufacturing	0.10%	0.57%	2.22%	**30.98%**	2.81%	63.08%	0.24%	100%
Wholesale	0.11%	0.85%	2.79%	**35.83%**	1.52%	58.66%	0.25%	100%
Retail & restaurant	0.07%	0.50%	1.97%	**20.55%**	1.09%	75.52%	0.29%	100%
Real estate	0.18%	1.07%	1.63%	**20.92%**	2.76%	72.74%	0.70%	100%
Transport. & telecom.	0.03%	0.33%	0.70%	13.89%	0.92%	**83.88%**	0.24%	100%
Electr., gas, water, & heat sup.	0.00%	0.00%	0.00%	**21.02%**	2.84%	75.57%	0.57%	100%
Services	0.07%	0.49%	1.09%	15.36%	1.36%	**81.29%**	0.34%	100%

There is also some industry specificity in the distribution of the closing day date in a month (Table 3-8: N = 336,621). Firms in primary industries, e.g.,Transportation & telecommunication firms, and Services firms have a greater tendency to set a closing day at month end, while the 20th is relatively common for firms in secondary industries, e.g., Wholesale firms.

3.5.2. Payment day

Similar to a closing day, two different pieces of information about a payment day are available: the payment day for firms' *primary* method of payment, and for their *secondary* one (if any). From the TDB data, we find that a payment day is usually set in the month next to the one when the deal is done (for 83.38% of the sample firms (N = 337,322)). However, a non-negligible fraction of firms set the payment day two months later (13.65%). The corresponding figures in the case of the secondary method are 65.47% (next month) and 27.81% (two months later).

When we break down the sample firms by their location, we find that the ratio of firms that set a payment day two months later is higher in eastern Japan, especially in the Kanto area (more than 15% for the primary method), while the ratio of the firms that set one in the next month is higher in western Japan. These regional differences overlap with those of the closing day date. Prefectures with more firms setting a closing day on the 20th tend to have more firms with a payment day two months later, while those with more firms setting a closing day on the 31st have more firms with a payment day in the next month. For the secondary payment method, the later payment month for eastern prefectures is more clear (for many prefectures two months later account for more than 35%), but the earlier one for western prefectures is less clear.

When we break down the sample by industry (N = 336,928), the fraction of firms setting a payment day for the primary payment method in the next month is highest in Forestry & hunting (90.5%: N = 116), Retail & restaurant (90.4%: N = 40,576), and Fishery (89.5%: N = 332) firms, while setting two months later is highest in Transportation & telecommunication (22.7%: N = 17,344), Services (19.2%: N = 57,210), and Construction (16.8%: N = 62,059) firms. As for the secondary payment method, the differences in the corresponding fractions by industry are less clear.

Table 3-9. Date of the monthly payment day

Primary payment method			Secondary payment method		
date in a month	freq.	%	date in a month	freq.	%
5	15,218	4.53	5	2,554	5.28
10	46,612	13.86	10	6,985	14.45
15	27,274	8.11	15	5,310	10.98
20	43,941	13.07	20	6,680	13.82
25	18,928	5.63	25	2,599	5.38
30	1,018	0.3	30	402	0.83
31	176,704	52.55	31	22,594	46.73
Others	6,571	1.95	Others	1,224	2.53
Total	336,266	100	Total	48,348	100

Within a month, a majority of firms set the payment day on the 31st (end of month) as shown in Table 3-9. However, the 10th and 20th are also common. Together with the finding above, the most common practice for credit payment in the firms of Japan is to *close at the end of the same month and pay at the end of the next month*; although, alternatively, the payment day might frequently be set on the 10th and 15th, and two months later.

Table 3-10. Payment day date (=x) by prefecture (primary payment method)

pref.	x=5th	x=10 th	x=15 th	x=20 th	x=25 th	x=31st	Others	total
Hokkaido	3.96%	11.96%	6.55%	12.97%	6.06%	57.05%	1.46%	100%
Aomori	4.07%	13.48%	8.50%	12.16%	4.98%	54.73%	2.10%	100%
Iwate	3.97%	10.15%	5.84%	8.66%	4.66%	**64.92%**	1.79%	100%
Miyagi	3.73%	9.87%	5.48%	9.19%	4.00%	**66.05%**	1.67%	100%
Akita	5.51%	14.43%	8.20%	11.40%	6.02%	52.39%	2.04%	100%
Yamagata	4.66%	12.15%	8.76%	13.27%	6.29%	50.68%	4.19%	100%
Fukushima	4.92%	11.54%	5.72%	9.93%	6.06%	59.63%	2.18%	100%
Ibaraki	4.53%	12.40%	5.77%	10.47%	4.71%	**60.43%**	1.69%	100%
Tochigi	5.38%	11.64%	8.29%	11.20%	5.92%	55.29%	2.30%	100%
Gunma	5.34%	13.18%	7.40%	13.26%	6.59%	51.54%	2.67%	100%
Saitama	6.68%	13.02%	7.09%	11.24%	5.32%	54.77%	1.88%	100%
Chiba	5.69%	13.08%	7.28%	10.50%	4.91%	56.92%	1.62%	100%
Tokyo	5.23%	11.95%	6.92%	8.96%	3.92%	**61.11%**	1.91%	100%
Kanagawa	6.13%	11.95%	7.01%	8.51%	3.77%	**60.68%**	1.96%	100%
Niigata	3.43%	**20.50%**	12.15%	18.74%	6.20%	35.37%	3.61%	100%
Toyama	2.92%	19.84%	12.82%	**24.50%**	7.40%	30.58%	1.94%	100%
Ishikawa	1.73%	19.83%	12.42%	**26.64%**	8.67%	28.75%	1.95%	100%
Fukui	2.53%	**26.64%**	17.86%	**24.19%**	6.58%	20.80%	1.38%	100%
Yamanashi	4.48%	12.41%	6.85%	12.83%	7.89%	53.55%	2.01%	100%
Nagano	4.16%	15.13%	8.51%	15.42%	7.75%	45.64%	3.39%	100%
Gifu	3.20%	**20.32%**	11.78%	**20.38%**	7.61%	33.54%	3.15%	100%
Shizuoka	4.25%	13.03%	7.33%	14.29%	8.10%	50.42%	2.57%	100%
Aichi	4.31%	13.57%	8.02%	17.41%	7.15%	47.31%	2.24%	100%
Mie	3.40%	**20.53%**	10.42%	16.60%	7.05%	39.59%	2.41%	100%
Shiga	4.06%	**22.87%**	12.02%	**20.15%**	4.83%	34.16%	1.90%	100%
Kyoto	5.82%	**23.06%**	11.22%	16.23%	5.78%	36.02%	1.88%	100%
Osaka	4.97%	16.75%	10.61%	17.65%	5.61%	42.04%	2.38%	100%
Hyogo	3.76%	18.99%	11.18%	17.38%	5.71%	40.86%	2.13%	100%
Nara	3.86%	**21.00%**	10.83%	**20.71%**	5.77%	35.85%	1.99%	100%
Wakayama	1.79%	**24.87%**	12.41%	**21.29%**	6.76%	29.75%	3.13%	100%

Tottori	3.03%	15.14%	11.59%	16.87%	7.79%	40.57%	5.02%	100%
Shimane	2.59%	17.51%	14.72%	19.03%	6.10%	34.95%	5.12%	100%
Okayama	3.21%	14.20%	7.23%	15.10%	8.94%	48.11%	3.21%	100%
Hiroshima	3.29%	12.38%	8.40%	14.29%	8.26%	51.36%	2.02%	100%
Yamaguchi	3.78%	11.35%	5.88%	10.27%	6.07%	**60.55%**	2.09%	100%
Tokushima	2.88%	12.59%	8.50%	17.09%	6.50%	48.66%	3.77%	100%
Kagawa	3.08%	17.72%	10.79%	16.53%	10.12%	37.90%	3.87%	100%
Ehime	2.42%	13.27%	9.20%	13.65%	7.16%	51.00%	3.32%	100%
Kochi	2.71%	14.58%	8.24%	13.88%	8.02%	48.18%	4.39%	100%
Fukuoka	4.32%	9.92%	5.77%	9.23%	5.40%	**62.76%**	2.61%	100%
Saga	2.91%	7.94%	6.33%	12.09%	7.21%	**60.15%**	3.38%	100%
Nagasaki	3.26%	9.58%	5.45%	8.92%	5.83%	**65.02%**	1.93%	100%
Kumamoto	3.75%	9.36%	5.97%	9.50%	4.45%	**64.60%**	2.37%	100%
Oita	2.48%	9.60%	5.15%	9.79%	6.45%	**63.42%**	3.11%	100%
Miyazaki	2.54%	8.80%	5.22%	10.25%	5.82%	**63.50%**	3.87%	100%
Kagoshima	1.96%	7.36%	4.60%	9.97%	5.87%	**68.60%**	1.64%	100%
Okinawa	3.01%	5.92%	3.01%	2.76%	3.44%	**79.66%**	2.20%	100%

Is there any regional difference in the distribution of a payment day within a month? We find some, as shown in Table 3-10, for the primary payment method (N = 336,294). A payment day on the 31st is more common for firms in Tohoku (northeastern), Kanto (eastern) and Kyshu (western), whereas many firms set one on the 10th or the 20th in central Japan. As for the secondary payment method, we find far less clear regional differences

Table 3-11. Payment day date (=x) by industry

Industry	x=5th	x=10 th	x=15th	x=20 th	x=25 th	x=31st	Others	total
Agriculture	2.93%	7.75%	4.14%	7.07%	3.16%	**73.59%**	1.37%	100%
Forestry & hunting	0.88%	5.26%	5.26%	8.77%	8.77%	**70.18%**	0.88%	100%
Fishery	2.42%	11.21%	2.12%	4.85%	1.82%	**76.36%**	1.21%	100%
Mining	4.19%	8.98%	3.79%	**12.97%**	**15.57%**	50.50%	4.00%	100%
Construction	5.59%	**14.81%**	9.05%	**14.84%**	7.48%	45.50%	2.74%	100%
Manufacturing	6.23%	**14.04%**	8.84%	**15.57%**	7.28%	45.29%	2.74%	100%
Wholesale	4.16%	**15.27%**	9.34%	**13.95%**	4.66%	50.41%	2.22%	100%
Retail & restaurant	2.48%	**13.63%**	7.62%	**13.47%**	4.06%	56.93%	1.81%	100%
Real estate	3.30%	**14.77%**	5.23%	8.55%	4.90%	**61.43%**	1.81%	100%
Transport. & telecom.	4.51%	10.67%	6.03%	9.86%	5.58%	**61.10%**	2.27%	100%
Electr., gas, water, & heat sup.	2.29%	10.86%	6.29%	9.71%	5.14%	**62.29%**	3.42%	100%
Services	3.55%	11.86%	6.13%	8.58%	4.23%	**64.06%**	1.59%	100%

Finally, we check whether the payment day date differs by industry (Table 3-11: N = 335,879). Similar to

the case of a closing day, we find that each month end is common for the primary and tertiary industries (except for Retail & restaurant), and the 10th and 20th are frequently used by the secondary industries. Again, such relationships are far less clear in the case of a payment day for the secondary payment method

On balance, we find interesting differences in the setting of a closing day and a payment day depending on firms' location and industry. Some of the differences seem to be linked with each other because the differences exist between similar sets of prefectures and industries. However, the grouping of prefectures and industries does not necessarily overlap. It would be interesting to further pursue the interrelation between a closing day and a payment day and their regional and industry differences, not only from a theoretical but also from a historical perspective.

3.6. Credit period

3.6.1. Length of payment period (contracted term)

We have different pieces of information about the payment period, or the duration of trade credit. First, we can compute the lag (days) between a payment day and a closing day, which we label CP_DIFFERENCE. Note that the invoice for a particular payment is processed on the buyer firm's closing day that comes nearest to the deal, and the payment is made on the next payment day. So, if a deal is done on the closing day, the buyer receives an invoice immediately, and the method of payment is cash: the CP_DIFFERENCE equals the credit period.[12]

However, this is not the case if promissory bills are used for the payment method. This is because in such a case a "payment day" is not the day that the seller receives cash. To grasp the length of the credit period in such a case, the TDB data provide us with information about the length of a credit period from the day of delivery to the day the seller actually receives cash. This information is available not only for payment by promissory bills, but also by cash. Below we label these lengths as LENGTH_BILLS (for payment by bills) and LENGTH_CASH (for payment by cash). As explained above, depending on when in a month a deal is done, the credit period varies by 30 days at maximum. LENGTH_BILLS and LENGTH_CASH measure the length of the shortest credit period (i.e., the period when a deal is done on the closing day). Note that by definition LENGTH_CASH should be equal to CP_DIFFERENCE, although we will still find some differences.

Note that these variables are based on TDB's research on firms' *ordinary* payment. Firms might make payments before and after the payment is due, and so the length of the *actual* (or ex post) payment period might be different. In this sense, these variables provide information about a contracted term (length) of trade credit.

Table 3-12. Difference between closing and payment days

	N	mean	sd	min	p1	p50	p99	max

[12] If a deal is done one day after the closing day of a buyer firm, then CP_DIFFERENCE equals 30 (one month) plus this length, because the deal is processed on the next closing day.

CP_DIFFERENCE for primary payment method	336,181	30.918	11.480	-31	10	31	62	187
CP_DIFFERENCE for secondary payment method	46,097	34.975	17.751	-26	5	31	93	186

The TDB data show that the mean and the median duration between a closing day and a payment day is, respectively, 30.92 and 31 days for the primary payment mothod, and 34.98 and 31 days for the secondary method. Note that, although the mean and the median are comparable in the case of the primary payment method; they are different, and the mean is longer, in the case of the secondary method.

Table 3-13. Difference between closing and payment days (frequency)

CP_DIFFERENCE for primary payment method			CP_DIFFERENCE for secondary payment method		
days	freq.	%	days	freq.	%
-31–4	111	0.03%	-26–1	32	0.07%
0	848	0.25%	0	277	0.60%
1–11	15,952	4.75%	1–11	3,237	7.02%
12–21	54,304	16.15%	12–21	8,034	17.43%
22–30.5	28,994	8.62%	22–30	3,461	7.51%
31	163,036	48.50%	31	13,579	29.46%
32–41	28,008	8.33%	32–41	4,214	9.14%
42–62	41,752	12.42%	42–62	11,691	25.36%
63–93	3,016	0.90%	63–93	1,449	3.14%
94–187	160	0.05%	98–186	123	0.27%
Total	336,181	100	Total	46,097	100

As this frequency table shows, 31 days (= 1 month) is the most common length, although shorter or longer durations are also observed. A negative length indicates prepayment.

Table 3-14. Length of credit period

	N	mean	sd	min	p1	p50	p99	max
LENGTH_CASH	357,015	28.146	12.521	0	1	30	60	710
LENGTH_BILLS	79,729	87.662	22.977	0	30	90	130	990

Turning to LENGTH_CASH and LENGTH_BILLS, the former is on average one month (28.15 days in mean and 30 days in median: N = 357,015). This is consistent with the results for CP_DIFFERENCE, but they are not exactly the same. The maximum length is 710 days, or about 24 months, which is extraordinarily long. It would be interesting to investigate for what characteristics of firms such a long period is allowed (or enforced). Again, CP_DIFFERENCE and LENGTH_CASH should by definition take the same value for each

firm. We thus need to check what the causes of the differences are between them.

In contrast, LENGTH_BILLS is about 90 days, or 3 months on average. This means that the sellers usually receive promissory bills of which the maturity is 2 months, because the difference between a closing day and a payment day is usually one month. Again, the maximum of 990 days, or 33 months, is interesting. We should also note that the minimum of zero is strange and such firms might need to be eliminated from the analysis because a promissory bill is used to make payment after the payment day. The reason for this zero payment period might be because checks (which should be included in "cash") are misidentified as promissory bills by firms and/or by TDB researchers.

3.6.2. Length of credit period (actual term)

The three variables introduced above, i.e. CP_DIFFERENCE, LENGTH_CASH, and LENGTH_BILLS, measure the length of the payment period that the sample firms usually use. However, these are the lengths of the payment periods on a *contract* basis (or ex ante length). They are not necessarily the same as the actual length of a payment period (ex post length), because firms may not necessarily make payment before the end of the agreed payment period.[13]

One measure of the actual length of a payment period is the days in payables or in receivables. *Days in trade payables* (also known as days purchase outstanding, days payable outstanding (DPO), days payable, or days in payable) is defined as follows:

$$\text{DTP} = (\text{trade payables}) / (\text{cost of goods sold} / 365),$$

where trade payables are the sum of account payables and bills payables. Days in trade payables equals 365 times *trade debt turnover* (= trade payables / cost of goods sold), and measures the number of days that firms need to make repayment for their purchases.

We can also calculate a corresponding length of the collection period. *Days in trade receivables* (also known as days sales outstanding, days in receivables, or days in account receivables) is defined as follows:

$$\text{DTR} = (\text{trade receivables}) / (\text{sales} / 365)$$

where trade receivables are the sum of account receivables and bills receivables. Days in trade receivables is equivalent to 365 times to *trade credit turnover* (= trade payables / sales), and measures how many days sales credit exists, or in what days firms collect sales credit. It would be interesting to calculate these days

[13] Note that in the case of promissory bills, buyers rarely pay *after* the period end due to the special repayment enforcement mechanism attached to promissory bills. The same penalty is not applied to default on accounts payables (bank transfer), but anecdotal evidence shows that it also seems to be rare to make payment after its period for fear of establishing bad reputation.

separately for cash payments and for payments by promissory bills, but it is impossible to do so because the corresponding denomitors are not available.

Table 3-15. Days in payables and receivables

	N	mean	sd	min	p50	max
DTP	176,994	42.278	67.275	0	27.216	2017.571
DTR	181,713	38.579	46.728	0	27.347	728.369

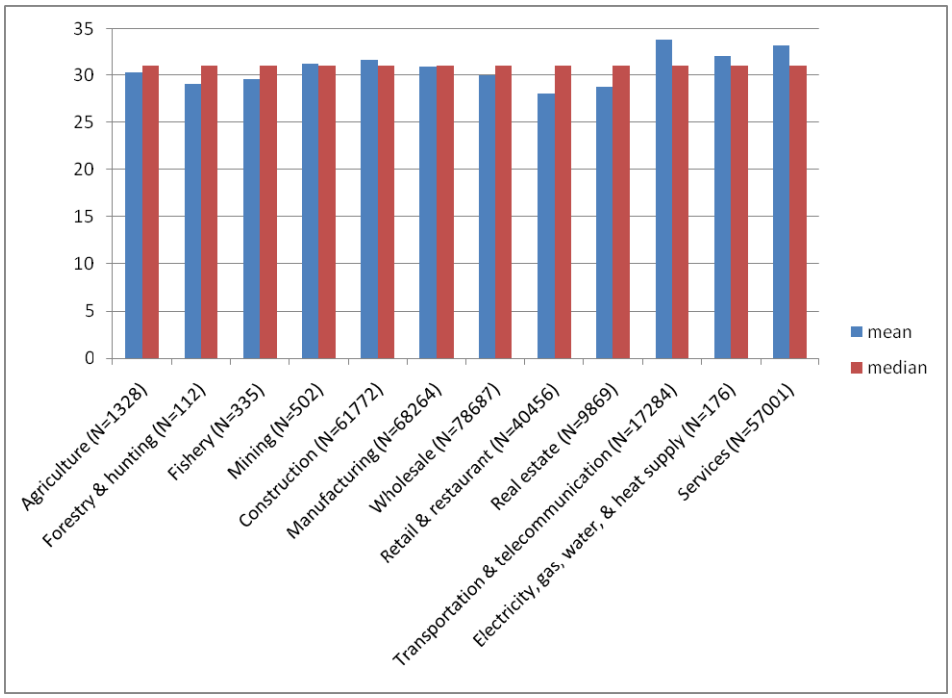
We find that actual length of payment and collection periods are both 27 days in median. They are somewhat shorter than, but are comparable to, the mean and the median of LENGTH_CASH. However, the means are longer than the medians, especially for payment. This is probably due to the inclusion of promissory bills in the numerators. However, we can at least conclude that the actual length of the payment period is not extraordinally different from the contracted length. Note that the number of observations is smaller than those of the base sample because the information source of these variables, i.e. financial statement information, is not available for all the base sample firms.

3.6.3. Univariate analysis of payment period (contracted term)

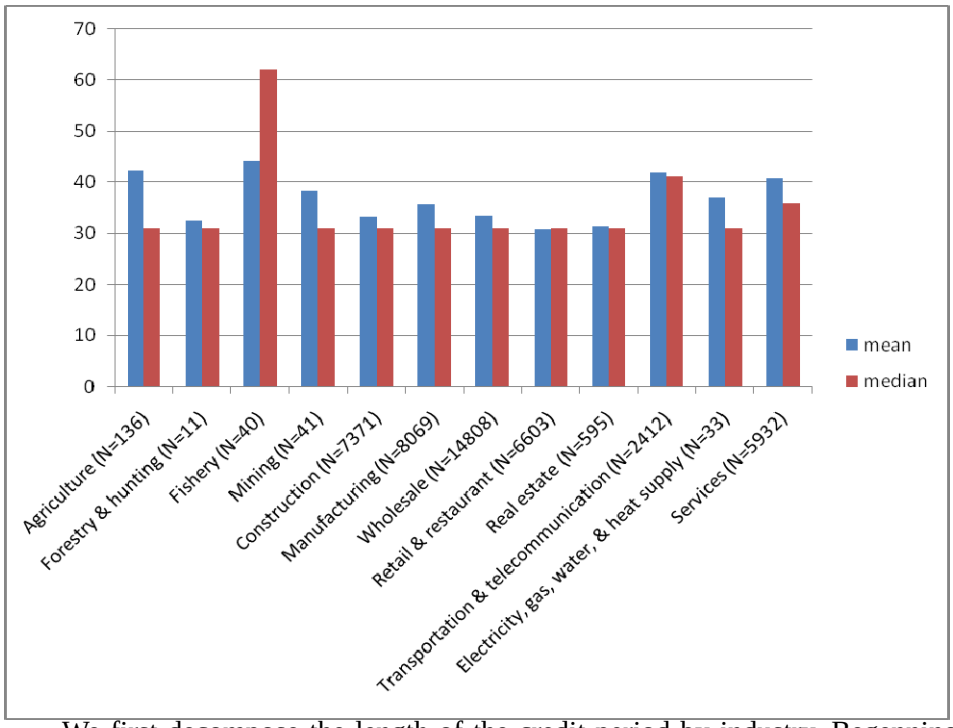
We now conduct an univariate analysis on the three payment period variables (on a contract basis), CP_DIFFERENCE, LENGTH_CASH, and LENGTH_BILLS.

Figure 3-28. Difference between closing and payment days (in days) by industry

(1) For the primary method of payment



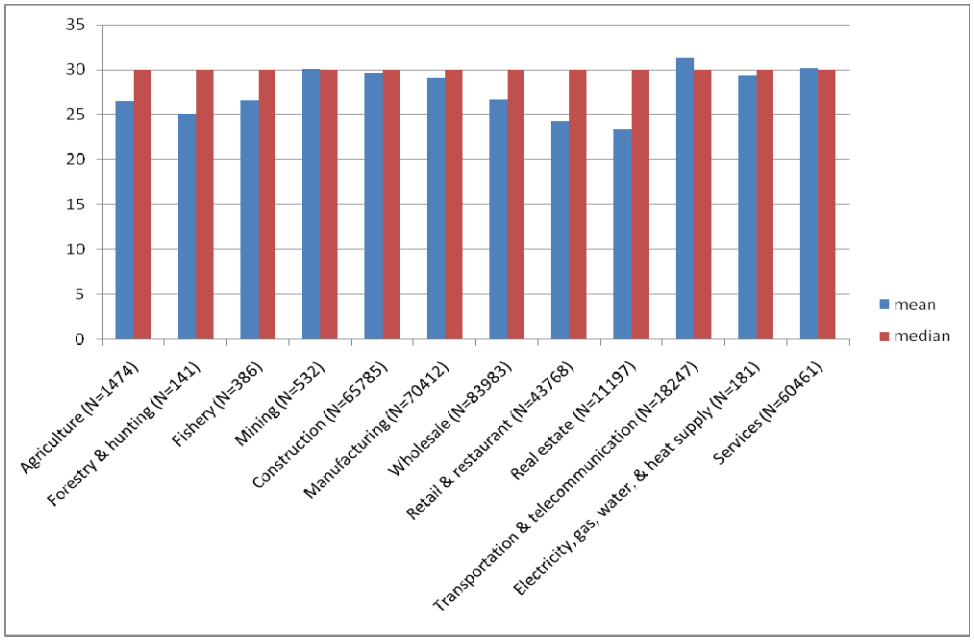
(2) For the secondary method of payment



We first decompose the length of the credit period by industry. Begenning with CP_DIFFERENCE for the primary method of payment, its median is 31 days (1 month) for all industries (panel (1) of Figure 3-28: N = 335,786). The means have some variation from the shortest length (28.0 days) for Retail & restaurant to the longest length for Transportation & telecommunication (33.8 days).

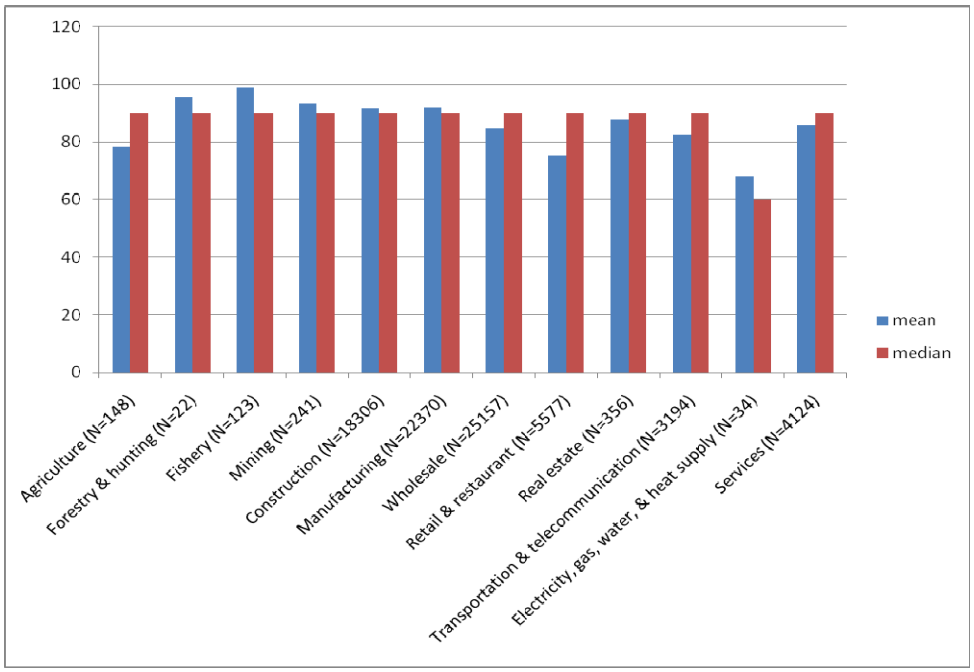
As for the secondary method of payment, we see wider variations (panel (2) of Figure 3-28: N = 46,051). The medians for Fishery (62 days), Transportation & telecommunication (41 days), and for Services (36 days) are longer than 31 days, and the means range from 30.8 days (Retail & restaurant) to 44.1 days (Fishery). Note that the number of observations for some industries, especially in the case of the secondary method of payment, is small.

Figure 3-29. Shortest credit period for cash payment (in days) by industry



Turning next to LENGTH_CASH, its median is 30 days for all industries (N = 356,567). The means differ in a similar manner to those of CP_DIFFERENCE, but their levels are shorter and their variation is slightly wider. The largest mean is 31.4 days for Transportation & telecommunication, which is not very long, but the shortest length of 23.4 days for Real estate is very short. It is interesting to remember here that we have already found that Real-estate firms depend on cash as a method of payment. Taken together, trade credit is not extensively used by Real-estate firms.

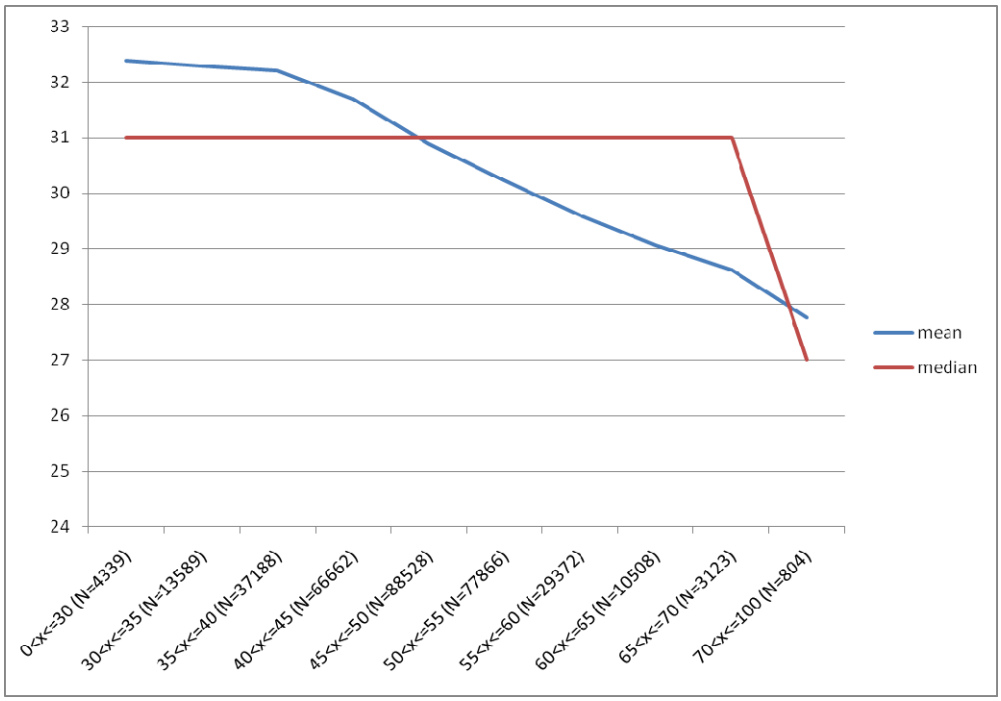
Figure 3-30. Shortest credit period for promissory bill payment (in days) by industry



Turning now to LENGTH_BILLS (N = 79,652), its median length is 90 days for all the industries except for Electricity, gas, water, & heat supply (60 days). The mean length ranges from 68.0 days for

Electricity, gas, water, & heat supply firms to 99.0 days for Fishery firms.

Figure 3-31. Difference between closing and payment days (in days) by credit score (=x)



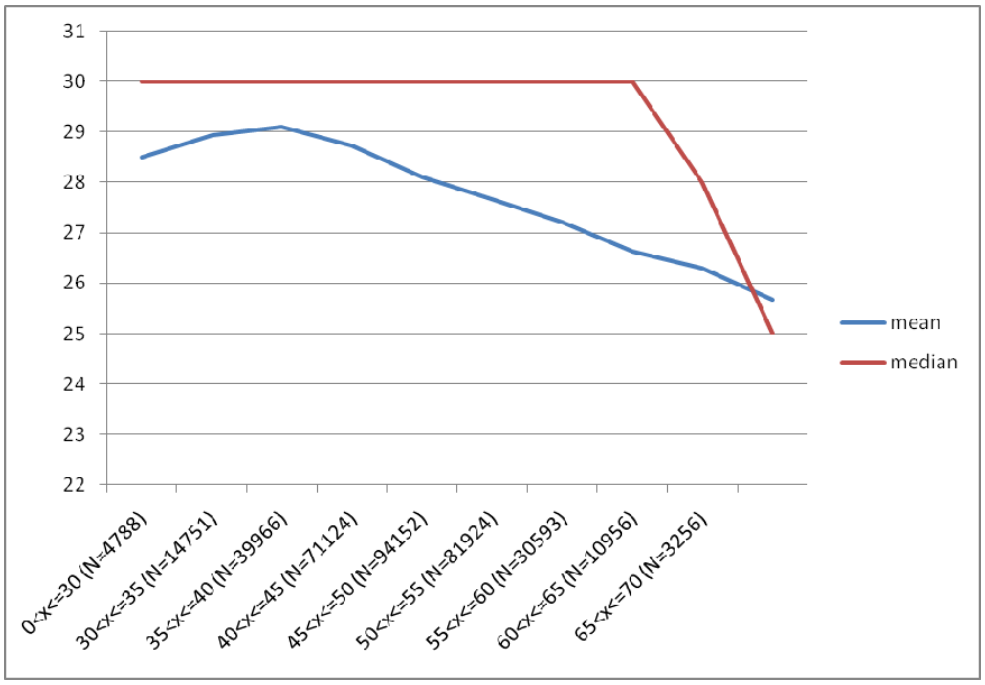
Next we interact the length of the credit period with other base variables. First, the median of CP_DIFFERENCE for the primary method of payment is always 31 days, except for very creditworthy firms: the median is 27 days for firms with a credit score of 70–100 (Figure 3-31: N = 331,979). The mean shows more clearly that the credit period is shorter for more creditworthy firms (from 33.4 days for firms with a score of 0–30 to 27.8 days for firms with a score of 70–100). Also, the mean is decreasing with the capital asset ratio (N = 217,072: from 32.5 days for negative ratio firms to 27.7 days for firms with the ratio of 0.9/1). These findings suggest that firms with especially high repayment ability borrow short. We are not exactly sure what drives this relationship, but these super creditworthy firms might have multiple closing days in a month.

Next, the mean CP_DIFFERENCE for the primary method of payment has meaningful relationships (e.g., increasing, decreasing, U-shaped, etc.) with some of the base variables and not with the others. However, in either case they only fluctuate within a range of 30–33 days, so no economically significant relationship exists (the number of observations are: the number of employees (N = 332,516), capital stock (N = 215,736), net current profit (N = 158,695), operating revenue (N = 151,408), the interest bearing debt operating revenue ratio (N = 132,881), and the number of suppliers (N = 302,825)).

As for the secondary method of payment, the median CP_DIFFERENCE is again almost always 31 days. The only exception is the 62 days for firms with zero capital stock, but there are only five such firms (N = 31,707). The mean fluctuates to a greater extent than the mean for the primary method, depending on the level of the base variables: around the range of 30–39 days. The mean length is generally decreasing with the number of employees (N = 45,738), credit rating (N = 45,712), capital asset ratio (N = 31,874) and the number of suppliers (N = 43,413); and generally exhibits a U-shape with respect to capital stock (N = 31,707), net

current profit (N = 23,720), operating revenue (N = 22,444), and the interest bearing debt operating revenue ratio (N = 20,196). In particular, the mean is longer for firms with more employees, a lower credit rating, a smaller capital asset ratio, a large capital stock; for those recording large losses or large surpluses in terms of net current profit, a smaller operating revenue, of which the interest bearing debt operating revenue ratio is high, and for those transacting with smaller number of suppliers.

Figure 3-32. Shortest credit period for cash payment (in days) by credit score (=x)



Turning to LENGTH_CASH, its median when categorized by the base variables is almost always 30 days, which is consistent with the 31 day median of CP_DIFFERENCE. One exception is a shorter period for firms with a very good credit score; the median length is 28 days for firms with a score of 65–70 and 25 days for those with a score over 70 (N = 352,360). This exception suggests that firms with more repayment ability borrow short, which is also consistent with the finding for CP_DIFFERENCE. The other exception is a shorter period (26 days) for firms that transact with more than 600 suppliers (N = 317,217).

The mean LENGTH_CASH also exhibits a decreasing relationship with credit score (N = 352,360) and the number of suppliers (N=317,217), except for firms with a very low score for which the relationship is decreasing (see Figure 3-32). The mean is also decreasing with the capital asset ratio (from 29.8 days for firms with a negative capital asset ratio to 25.6 days for the ratio 0.9/1: N = 228,159). However, the mean is generally increasing with the number of employees (from 26.7 days for firms with no employees to 29.4 days for those with 100–300: N = 352,777), is U-shaped with respect to capital stock (between 28.3 days and 31.2 days: N = 226,706), and is an inverted U-shape with respect to operating revenue (between 27.4 days and 29.5 days: N = 158,791) and the interest bearing debt operating revenue ratio (between 27.5 days and 29.4 days: N = 139,093). No clear relationship exists with respect to the net current profit (the mean ranging between 27.6 and 28.6 days: N = 166,628). Note that, again, LENGTH_CASH and CP_DIFFERENCE should be equivalent

by definition; thus, the differences in these univariate results are puzzling.

Turning now to LENGTH_BILLS, its median is 90 days for any categories broken down by the base variables. The mean is an inverted U-shape with respect to the number of employees (ranging between 85.0 and 88.7 days: N = 79,431), credit score (between 84.5 and 88.2 days: N = 79,315), the capital asset ratio (between 87.5 and 89.6 days: N = 59,320), operating revenue (between 86.0 and 90.5 days: N = 44,933), and the number of suppliers (between 82.9 and 88.2 days: N = 76,256). The mean is increasing with capital stock (between 85.8 and 89.6 days: N = 59,100) and is V-shaped with respect to net current profit (between 90.3 and 97.2 days: N = 46,921). The means for categories broken down by the interest bearing debt operating revenue ratio range between 89.0 and 91.1 days.

3.6.4. Univariate analysis of the credit period (actual term)

We also conduct a similar univariate analysis on the variables measuring the actual length of the credit period.

Figure 3-33. Days in trade payables (in days) by industry

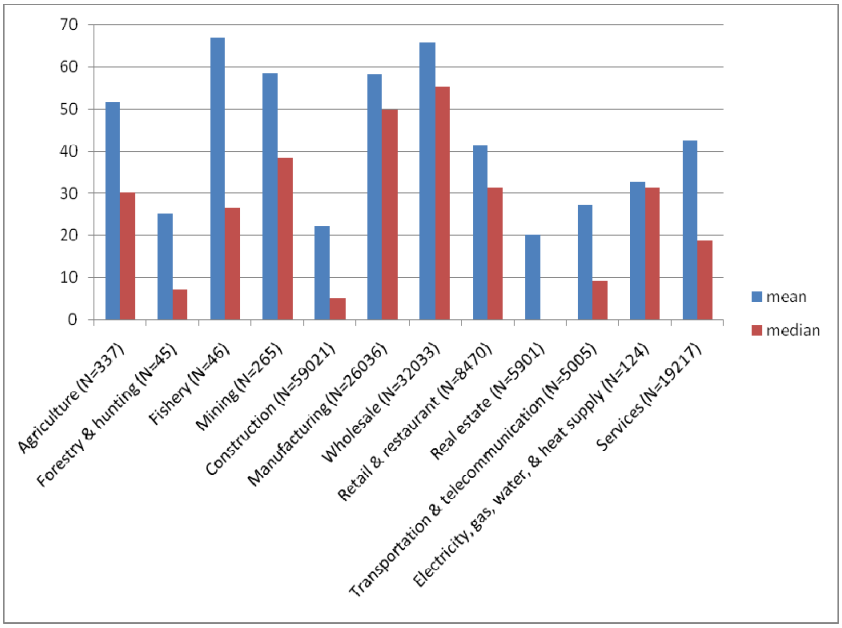
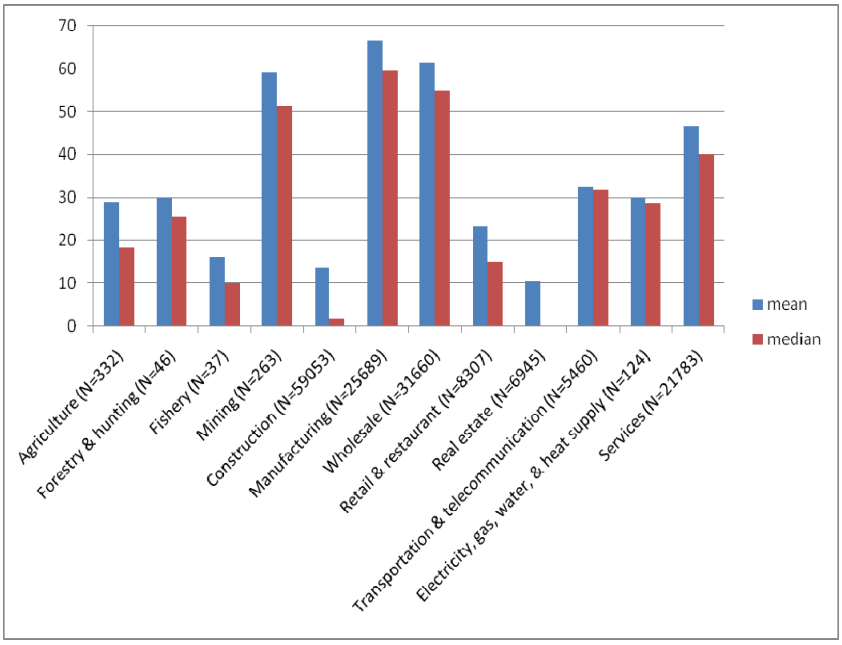


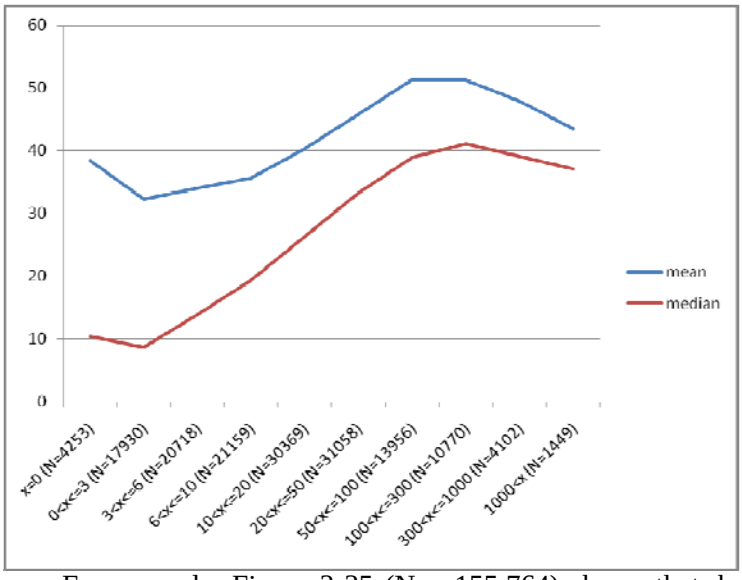
Figure 3-34. Days in trade receivables (in days) by industry



As Figures 3-33 and 3-34 show, the actual lengths of payment and collection periods (DTP (N = 156,500) and DTR (N = 159,699)) differ significantly by industry. Among industries with many observations, the length of a payment period is long for Wholesale (49.6 days in median) and Manufacturing (55.2 days in median), and the length of the collection period is long for Manufacturing (59.6 days in median), Wholesale (54.8 days in median), and Services (40.1 days in median). The long payment and/or collection periods for these industries might reflect a long period of payment and/or collection through promissory bills because, as the shown above, even the shortest credit period for a promissory bill payment (on a contract basis) is very long. This interpretation is consistent with earlier findings that the bill payment and collection ratios are high for Manufacturing and Wholesale firms. However, another earlier finding was that Services firms do not extensively use promissory bills for collections, so the long collection period for Services firms is puzzling. This finding might rather imply that for Services firms the length of an actual collection period is longer than that of a contract-based period.

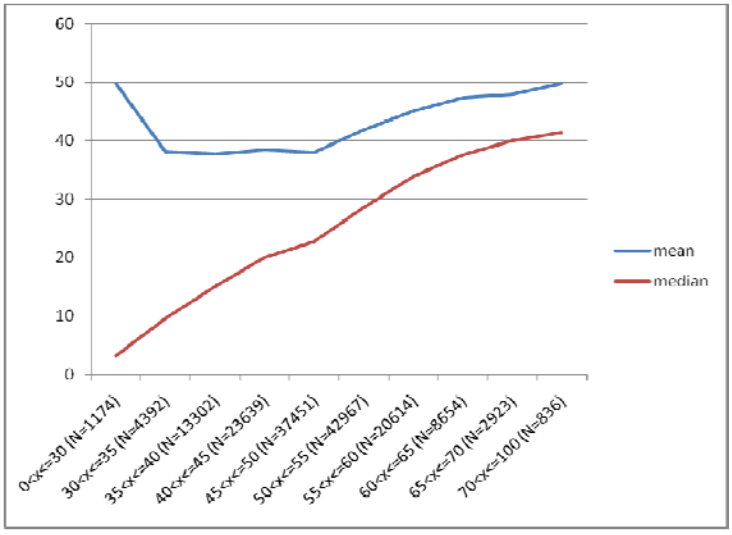
When interacted with the other base variables, we find that the actual length of payment and collection periods exhibits greater variations than the contracted length of the payment period, and that the variations are greater not only in terms of means but also in terms of medians. Also interestingly, the relationships between DTP and the base variables and those between DTR and the base variables are very similar.

Figure 3-35. Days in trade payables (in days) by firm size (x = # of employees)



For example, Figure 3-35 (N = 155,764) shows that, both in means and in medians, DTP exhibits an increasing relationship with the number of employees with some decreasing parts at both ends. A similar relationship also exists when DTR is interacted with the number of employees (N = 158,895).

Figure 3-36. Days in trade payables (in days) by credit score (=x)



We also find that as shown in Figure 3-36 (N = 155,952), DTP generally is increasing with firms' creditworthiness. The same holds for DTR as well (N = 159,094). These findings are in contrast with our earlier finding that on a contracted basis the length of the payment period is shorter for very creditworthy firms. Furthermore, both DTP and DTR are increasing with capital stock and operating revenue, are decreasing with the capital asset ratio, and are U-shaped with respect to net current profit. Finally, DTP and DTR are increasing with each other. These findings suggest that further investigation into the difference between the contracted and the actual length of the credit period would be interesting.

3.7. Trade credit volume

3.7.1. Descriptive statistics for trade credit volume

In this section, we present statistics for trade credit volume. Note that the number of sample firms significantly decreases from the original 380,000, because financial statements are not available for many of the firms.

Table 3-16. Volume of trade credit: Payables

		N	mean	sd	min	median	max
(1) account payables	amount (thousand yen)	193,327	228,000	1,540,000	0	6,425	46,100,000
	% in total asset		8.12%	13.26%	0.00%	2.31%	102.56%
(2) bill payables	amount (thousand yen)	185,575	96,600	401,000	0	0	8,750,000
	% in total asset		5.75%	10.07%	0.00%	0.00%	71.11%
(3) trade payables (=(1)+(2))	amount (thousand yen)	184,678	339,000	1,840,000	0	22,900	49,900,000
	% in total asset		13.50%	16.82%	0.00%	7.38%	111.98%

In means, our sample firms have 228 million yen of outstanding account payables and 96.6 million yen of outstanding bill payables, which are, respectively, 8.1% and 5.8% as a ratio to total assets. The total amount of these payables (= trade payables) is 339 million yen in mean, and account for 13.5% of the total assets. Because of an upward bias, their medians are smaller and are 6.4 million yen (2.3%) for account payables, zero for bill payables, and 22.9 million yen (7.4%) for trade payables. The zero median for bill payables is consistent with the statistics above, which show that more than half of the firms do not use promissory bills for payments.

We also find that firms with zero account payables account for 39.5% (76,261 out of 193,327 firms), those with zero bill payables account for 54.1% (100,336 out of 185,575 firms), and those with zero trade payables account for 25.5% (47,005 out of 184,678 firms) of the sample firms.

Table 3-17. Volume of trade credit: Receivables

		N	mean	sd	min	median	max
(1) account receivables	amount (thousand yen)	195,162	351,000	2,200,000	0	187,000	65,500,000
	% in total asset		14.02%	16.98%	0.00%	8.38%	90.73%
(2) bill receivables	amount (thousand yen)	185,804	68,000	331,000	0	950	7,860,000
	% in total asset		3.50%	6.56%	0.00%	0.26%	52.22%

(3) trade receivables (=(1)+(2))	amount (thousand yen)	185,398	438,000	2,520,000	0	30,200	71,600,000
	% in total asset		17.12%	18.60%	0.00%	11.49%	92.27%

As for collection, the mean account receivables are 351 million yen (14% of total assets), the mean bill receivables are 68 million yen (3.5%), and the mean trade receivables are 138 million yen (17.12%). Their medians are, respectively, 187 million yen (8.4%), 950 thousand yen (0.3%), and 30.2 million yen (11.5%). We also find that 34.7% of the firms (67,636 out of 195,162 firms) have zero outstanding account receivables, 44.2% of the firms (82,104 out of 185,804 firms) have zero outstanding bill receivables, and 19.9% of the firms (36,866 out of 185,398 firms) have zero outstanding trade receivables.

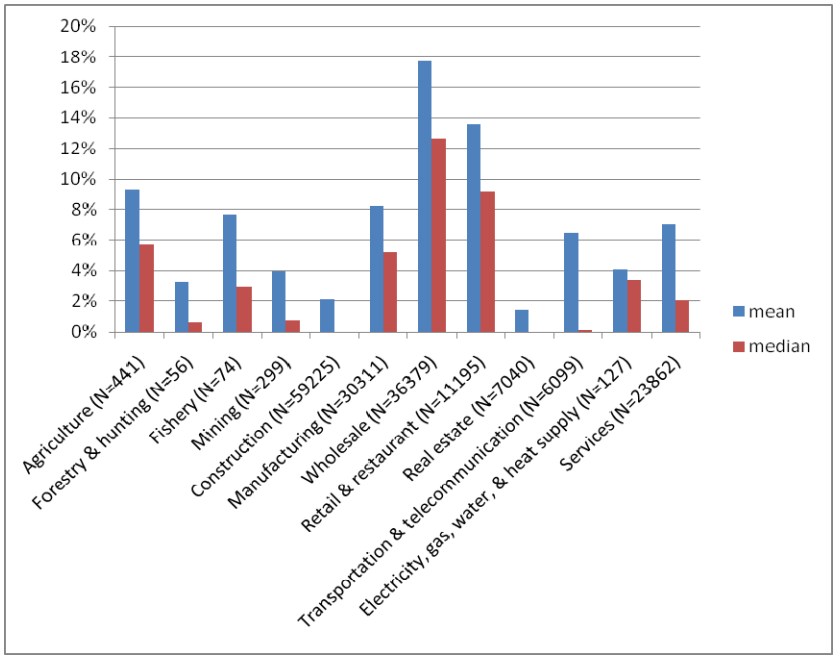
We find that, both in terms of means and medians, the amount of account receivables and trade receivables are, respectively, larger than that of account payables and trade receivables. Also, the amount of median bill receivables is larger than that of median bill payables. These findings suggest that the firms in these tables grant credit more than they are granted it. As mentioned earlier, the number of observations in these tables is smaller than the original 380,000 firms because the firms in these tables are those for which financial statement information is available Therefore, these firms are transparent firms. Our findings here might thus imply that transparent firms have “deep pockets.” Note, however, that the amount of mean bill receivables is smaller than that of mean bill payables; therefore, these firms receive bills less than they make them out.

3.7.2. Univariate analysis for trade credit volume

Is the amount of trade credit different depending on firm characteristics? We now report the univariate results for trade credit volume. Next, we focus on the results from the trade credit volume to total asset ratios and do not report those for the absolute volume. This is because the volume is highly correlated with firm size; an univariate analysis of them is significantly influenced by the size effect.

Figure 3-37. Payables to total asset ratio by industry

(1) Account payables to total asset (N = 175,108)



(2) Trade payables to total asset (N = 165,448)

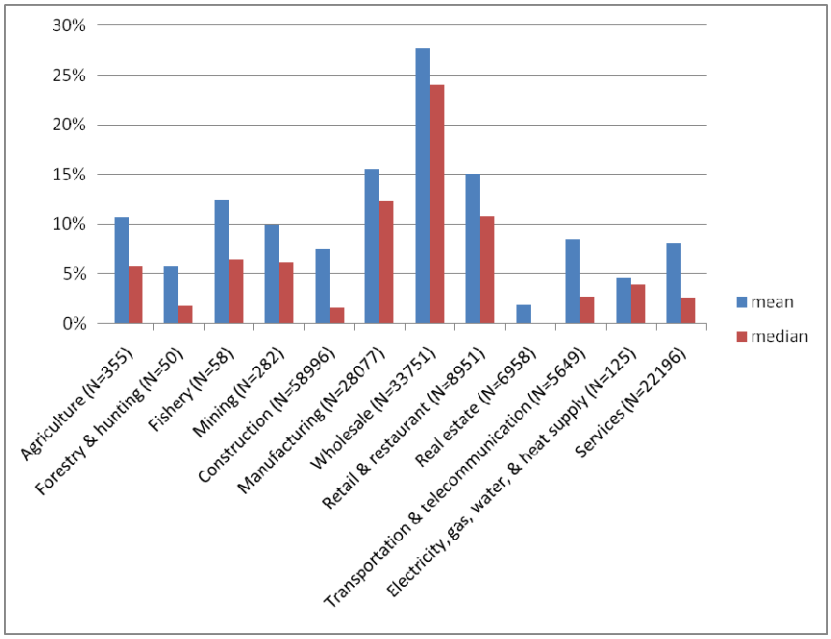
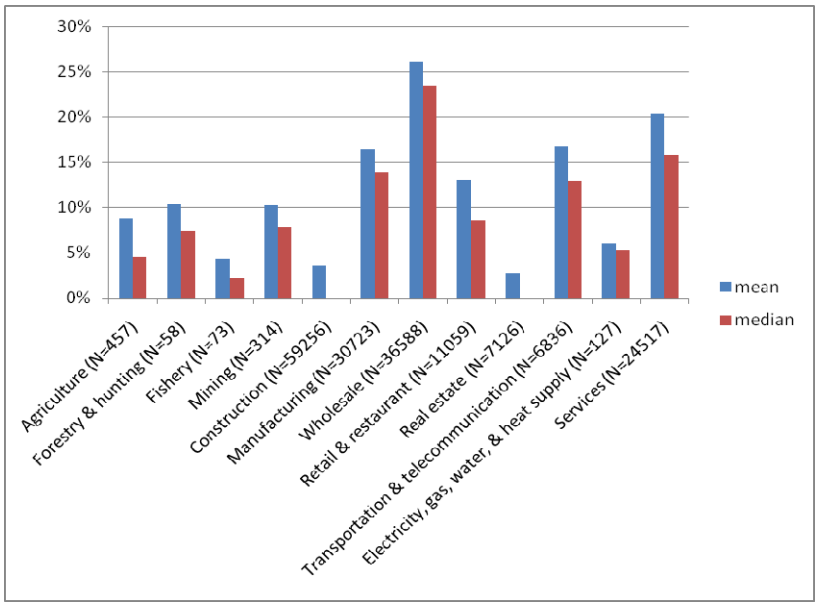
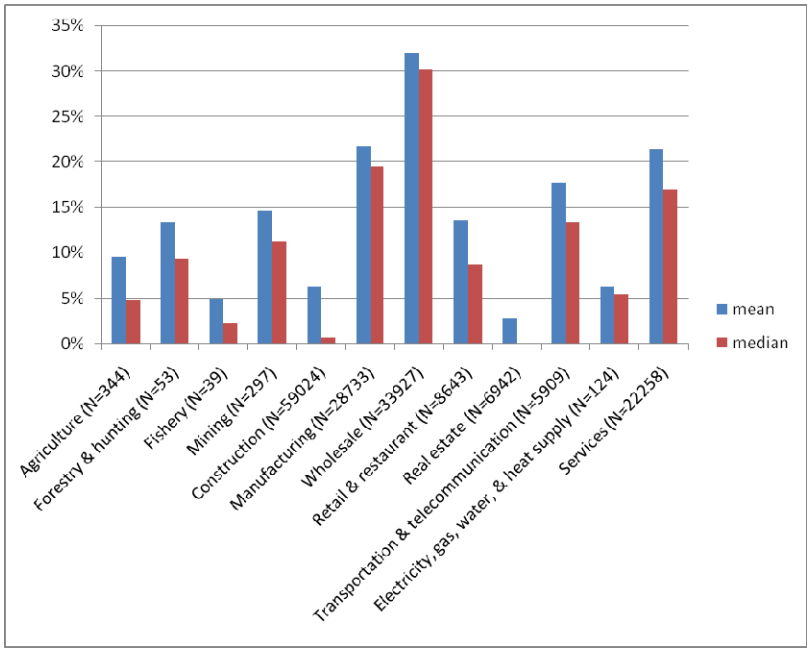


Figure 3-38. Receivables to total asset ratio by industry

(1) Account receivables to total asset (N = 177,134)



(2) Trade receivables to total asset (N = 166,293)



First, as these figures show, we find that trade credit is most extensively used by Wholesale firms. For example, their trade payables to total asset ratio is on average 27.7% (in mean) or 24.0% (in median), and trade receivables account for 32.0% (in mean) or 30.1% (in median) of their total assets. Trade credit is also somewhat extensively used by Manufacturing and Retail & restaurant firms for payment and by Manufacturing, Services, and Transportation & telecommunication firms for collections. Consistent with the results in earlier sections, Real-estate firms rarely use trade credit both for payment and for collections.

Figure 3-39. Bill payables to total asset by industry (N = 166,501)

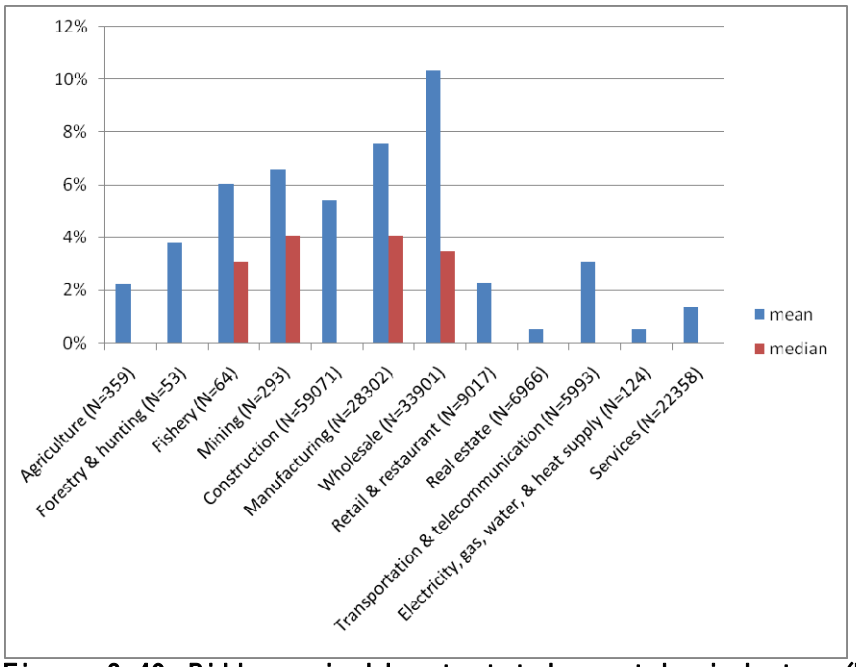
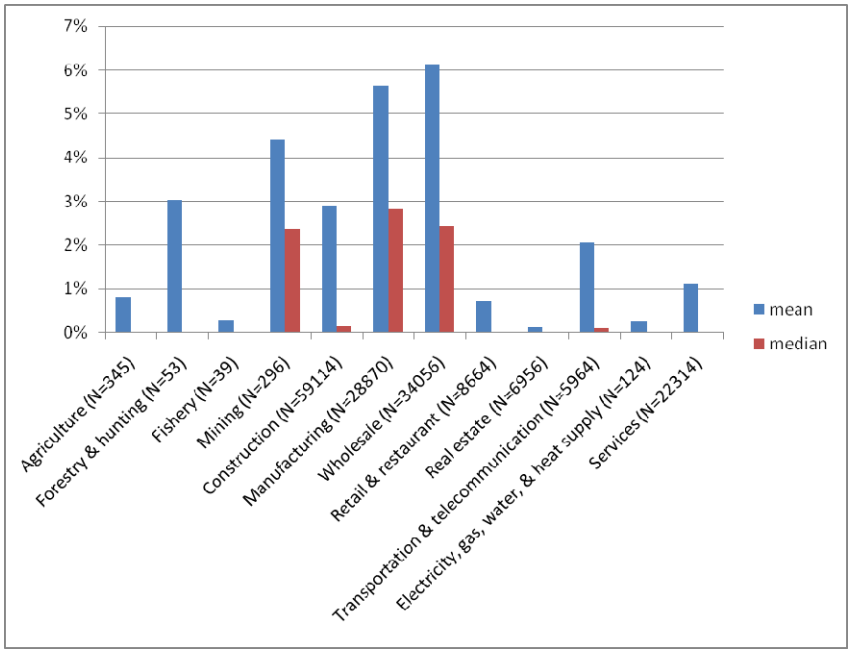


Figure 3-40. Bill receivables to total asset by industry (N = 166,795)

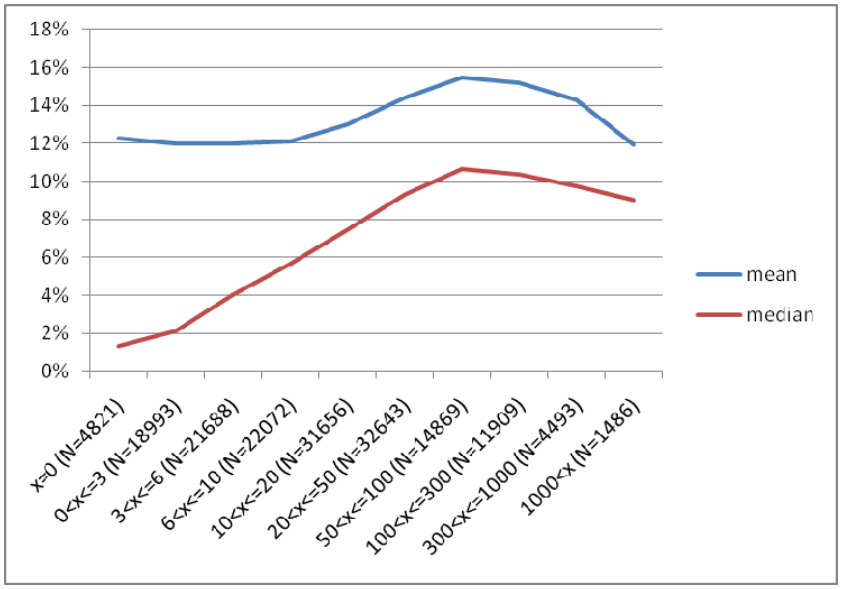


When we focus on promissory bills, among firms with large observations, bills are extensively used by Wholesale and Manufacturing firms and to a lesser extent by Construction firms. Mining firms also use promissory bills, but their number of observations is small. These findings are generally consistent with our finding earlier with respect to the payment and collection ratios.

When we interact trade credit volume with other base variables, we first find that the results for account payables and for trade payables are respectively very similar to those for account receivables and for trade receivables. This is probably because the amount of promissory bills is relatively small. This may allow us to focus on trade payables and trade receivables only. Second, however, we also find that the results for trade

payables and those for trade receivables are similar as well. We thus focus on the results for trade payables as representative results, and do not report other results unless there is a significant difference. Finally, regarding promissory bills, we find that univariate results on bill payables and those on bill receivables are different from those on trade payables and trade receivables, and they are also slightly different from each other. So we present the results on bill payables, and report those on bill receivables if notable differences exist.

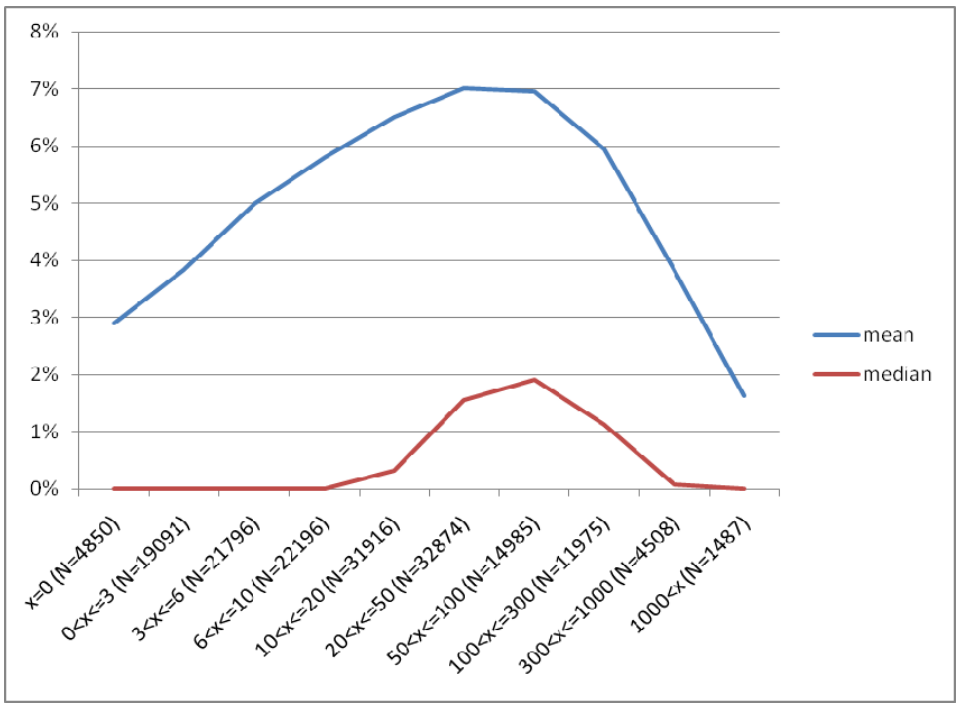
Figure 3-41. Trade payables to total asset ratio by firm size (x= # of employees)



As Figure 3-41 shows (N = 164,630), trade payables are generally increasing with the number of employees, although they decrease when the number is very large. A similar relationship appears with respect to trade receivables (N = 165,474), account payables (N = 174,199), and account receivables (N = 176,201). However, their means, and to a lesser extent their medians as well, decrease when the number of employees is very small (i.e., they exhibit a rotated-S shape). Furthermore, in the case of mean account payables, the decrease for the largest firms does not exist; therefore, the mean exhibits a U-shape. However, on balance larger firms have larger amounts of trade credit, and smaller firms have smaller amounts. Similar characteristics also appear when these amounts are interacted with credit score; on balance more creditworthy firms have larger amounts of trade credit, and less creditworthy firms have smaller amounts.

We also find that trade payables, trade receivables, account payables, and account receivables are generally decreasing with the capital asset ratio (N = 178,464, 179,257, 187,904, and 189,879, respectively) and with the interest bearing debt operating revenue ratio (N = 161,285, 161,194, 160,575, and 160,430, respectively); and are generally increasing with capital stock (N = 178,492, 179,298, 187,773, and 189,715, respectively) and operating revenue (N = 178,495, 178,532, 178,886, and 178,953, respectively). They are V- or U-shaped with respect to net current profit (N = 179,248, 179,447, 181,627, and 182,038, respectively). Note that the findings here are almost similar to the findings for the actual length of trade credit (i.e., DTP and DTR above). This similarity implies that the volume of credit and the length of the credit period are correlated.

Figure 3-42. Bill payables to total asset ratio by firm size (x= # of employees)



Turning to promissory bills, both bill payables (Figure 3-42: N = 165,860) and bill receivables (N = 165,975) exhibit an inverted U-shape with respect to the number of employees. We find that firms hiring 50–100 employees use promissory bills the most for both payment and collection. A relationship of a similar shape also exists with respect to credit score (N = 179,469 for DTP and 166,152 for DTR) and to operating revenue (N = 178,507 for DTP and 178,541 for DTR). We find that firms rated 55–60 use the bills the most. An inverted U-shape further exists with respect to capital asset ratio (N = 179,471 for DTP and 179,732 for DTR), capital stock (179,484 and 179,751), and interest bearing debt operating revenue ratio (161,171 and 161,132), although the peak is located far to the left in the case of bill payables versus capital asset ratio, bill payables versus interest bearing debt operating revenue ratio, and bill receivables versus interest bearing debt operating revenue ratio. No clear relationship exists between DTP or DTR and net current profit (N = 179,461 and 179,536, respectively).

3.8. Factoring

Next, we address some information about the use of *factoring*. Factoring is a transaction where a lender called a *factor* purchases the account receivables of firms. Thus, it is a form of discounting. However, factors can purchase multiple receivables collectively and/or future receivables. Thus, factoring is essentially lending collateralized by account receivables. The credit is explicitly linked to the value of a borrower's underlying assets and not to the borrower's overall creditworthiness.[14] Note that factors only purchase account receivables, and do not purchase promissory bills (bill receivables).

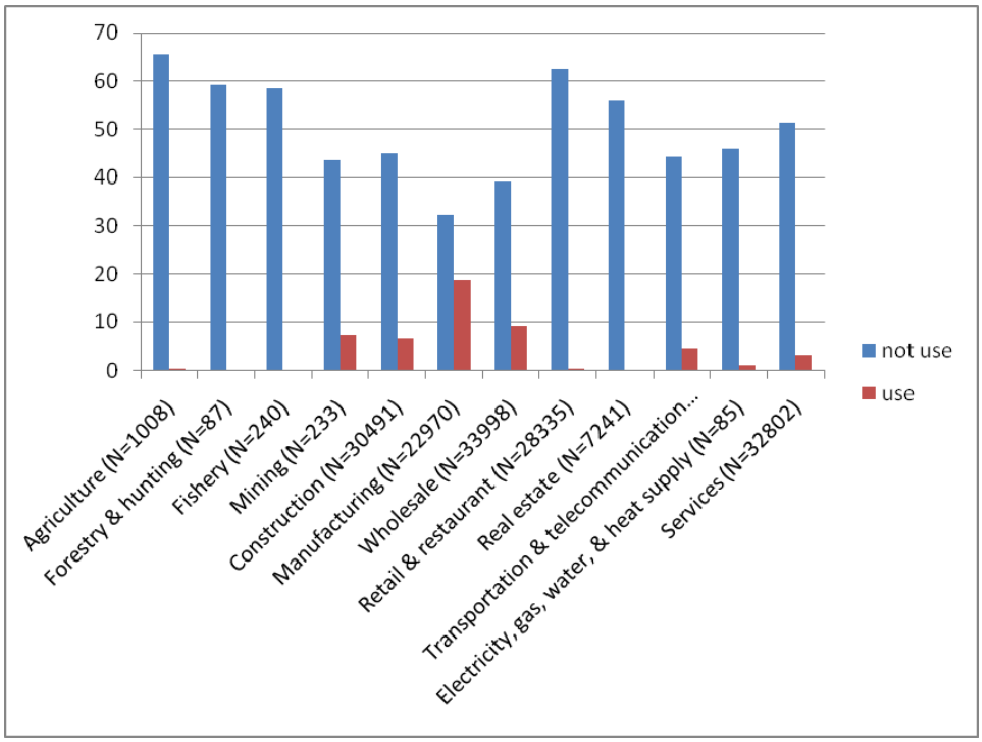
Table 3-18. Usage of factoring

[14] For more on factoring, see Bakker, Klapper, and Udell (2004).

	freq.	%
not used	165,980	44.88
used	29,053	7.85
unknown	174,836	47.27
Total	369,869	100.00

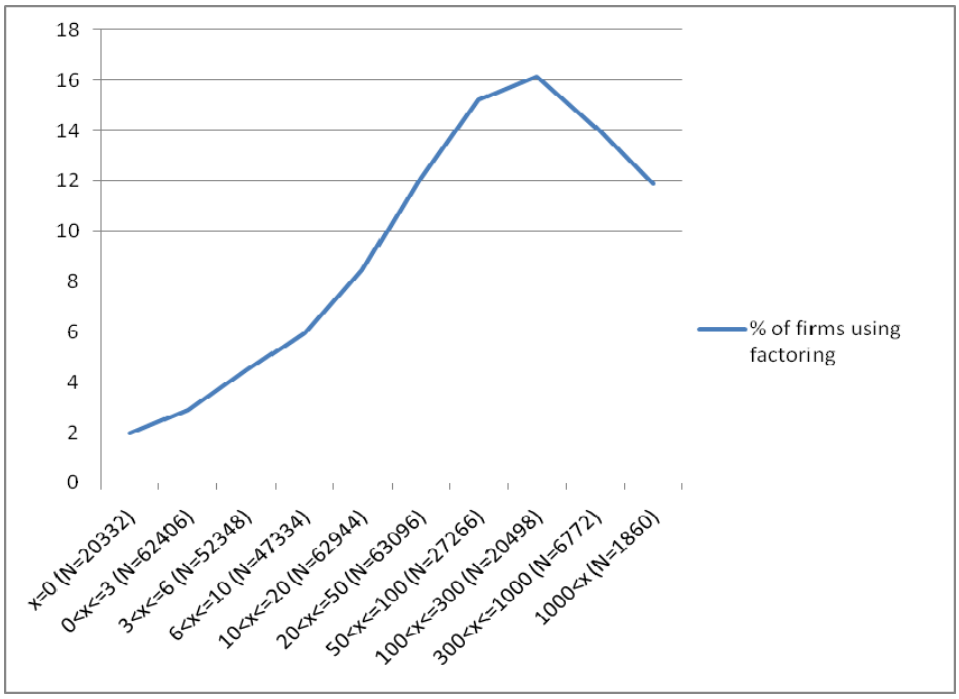
The TDB data show that about 7.9% of the sample firms use factoring (Table 3-18). However, note that we have an independent category, unknown, that indicates that the use/non-use of factoring is not identified. Excluding those firms, 14.9% of the firms use factoring.

Figure 3-43. The fraction of firms using factoring (%) by industry



When we divide sample firms depending on their industry (N = 369,520), factoring is extensively used by Manufacturing firms (18.8%), even if we include “unknown” firms. Factoring is also used by Wholesale (9.1%), Mining (7.5%), Construction (6.7%), Transportation & telecommunication (4.6%), and Service (3.3%) firms. Less than 1% of the firms in other industries use factoring.

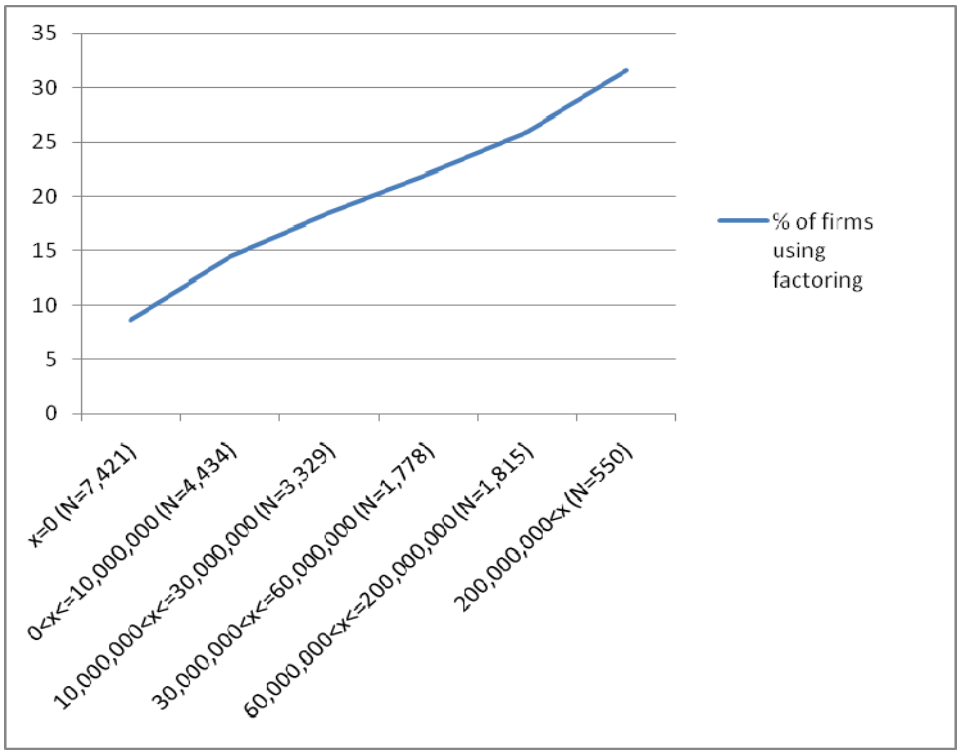
Figure 3-44. The fraction of firms using factoring (%) by firm size (x = # of employees)



As Figure 3-44 shows, the fraction of firms using factoring exhibits an inverted-U shape with respect to firm size (N = 364,856). Firms with 100–300 employees use factoring more extensively (16.2%). It is possible that these firms transact with large firms of which account receivables are highly creditworthy and easy to liquidate. An inverted-U shape also exists with respect to credit score (firms with the score of 65–70 use factoring the most (16.9%, N = 364,342)), capital asset ratio (firms with the ratio 0.2–0.3 use the most (12.0%, N = 234,416)), capital stock (firms with the stock of 50–100 million yen use the most (15.2%, N = 232,911)), and operating revenue (firms earning a profit of 5–10 billion yen use the most (19.8%, N = 162,744)). The fraction of firms using factoring exhibits a U-shape with respect to net current profit, with the fraction larger for the firms in the lowest profit category (17.1%) and the firms in the highest profit category (15.9%, N = 170,770).

The fraction of firms using factoring is larger for firms with more trade receivables. The fraction is generally increasing with the amount of account receivables (N = 176,173). The fraction is also generally increasing with CP_DIFFERENCE (the length of the period from the closing day to the payment day) for the primary method of payment, although the increase is not monotone (N = 334,821).

Figure 3-45. The fraction of firms using factoring (%) by discounted bills (x = amount of bills discounted)



The use of factoring is larger when firms use other methods of liquidating the credit they provide. First, as Figure 3-45 shows, the more the firms have banks discount their promissory bills, the more the fraction is. Second, the fraction is larger for firms registering the assignment of account receivables (14.7%) than those not doing so (5.8%).

Factoring is a method of liquidating account receivables. It might be interesting to compare its use with the use of bill discounting (having banks discount promissory bills), a method of liquidating bill receivables. For example, we find above that factoring is (generally) more extensively used by more creditworthy firms, but Ono et al. (2011) report that creditworthy firms do not necessarily use more bill discounting. We might be able to interpret differences like this in terms of the strong enforcement mechanism for repayment attached to promissory bills.

4. Legal System Relevant to Interfirm Relationships in Japan

This section provides the legal background that might be relevant when conducting further analysis of the data on the interfirm relationships derived from the credit reports from Teikoku Databank (TDB).

Before elaborating on the relevant legal rules, it must be pointed out that the interfirm relationship, or trade credit, has attracted less attention from legal studies, still less from law reformers. The lack of attention might partly be because the relevant laws are scattered in various spheres of law: in the Civil Law countries like Japan, some of the rules are contained in the law of obligations; some are in bankruptcy law, and still others are in corporate law. As far as the reservation of title to the supplied goods is concerned, some countries treat it as a kind of security interest and discuss it within the framework of secured transactions. Except for bankruptcy law, which has been one of the focuses of law reform after the Asian Financial Crisis at the end of

1990's, these subjects have not been considered the target of law reform. With the existing discussions on the subject in the economics literature, it is interesting to observe the lack of their influence on legal theories.

It is obvious that the issue of the interfirm relationship requires an integrated approach in legal as well as economic theories. It is for this reason that this paper summarizes the laws in Japan in relation to these issues..

4.1. Regulation on payment terms by the Subcontracting Act

The most important law about trade credit in Japan is the Subcontracting Act (The Act against Delay in Payment of Subcontract Proceeds to Subcontractors). Its apparent aim is to prevent the abuse of contractual power by principal contractors (as purchasers) against small- and medium-sized subcontractors (as suppliers). The Act requires the purchaser to make payment within 60 days of the supply of goods or services when the supply agreement qualifies as "subcontracting," which is the case when (a) the purchaser commissions the supply of goods or services to the supplier, and (b) the purchaser qualifies a size criterion and is thus considered as being large enough to abuse its power over the supplier.[15]

Some theories of trade credit predict that a two-part term for payment can be used as a device for screening creditworthy buyers (Smith 1987; Ng et al. 1999). The two-part term means that the seller gives the buyer a discount if the payment is made earlier. Such a two-part term is prohibited under the Subcontracting Act unless the effective interest rate equals the prime rate for the short-term lending.

4.2. Price discrimination and the Antimonopoly Act

Other theories regard trade credit as a tool for price discrimination (Schwartz and Whitcomb 1979; Brennan, Maksimovic, and Zechner 1988). If it means that large-scale buyers receive more favourable credit terms (Klapper, Laeven, and Rajan 2010), it could be regulated by the Antimonopoly Act. The Antimonopoly Act, which is the competition law in Japan, prohibits, as an unfair trade practice, the act of "unjustly" discriminating against the buyer with regards to the payment. Whether "unjust" or not is determined by analyzing the anticompetitive effects of the price discrimination. Another argument is that trade credit might be offered regardless of the creditworthiness of the buyer and that such a practice results in effect in reducing the price for the low-credit buyer (Petersen and Rajan 1997; Ng, Smith and Smith 1999). This is less likely to

[15] If the agreement is for the supply of goods, the regulation applies when (i) the purchaser (principal contractor) is a corporation with the stated capital of more than 300 million yen, and the supplier (subcontractor) is an individual or a corporation with the stated capital of 300 million yen or less; or (ii) the purchaser is a corporation with the stated capital of 300 million yen or less but more than 10 million yen, and the supplier is an individual or a corporation with the stated capital of 10 million yen or less. In the case of the supply of services or information-based products (such as computer programs or movies), the regulation applies when (i) the purchaser is a corporation with the stated capital of more than 50 million yen, and the supplier is an individual or a corporation with the stated capital of 50 million yen or less; or (ii) the purchaser is a corporation with the stated capital of 50 million yen or less but more than 10 million yen, and the supplier is an individual or a corporation with the stated capital of 10 million yen or less.

constitute an unfair trade practice because the trade term is non-discriminatory on its face.

4.3. The retention of title

Some studies consider that a supplier has a special advantage to liquidate the goods that it supplied when the buyer is in default, making it possible to grant more credit to the buyer than other creditors (Longhofer and Santos 2003; Frank and Maksimovic 2005; Fabbri and Manichini 2009). Legally speaking, the general rule is that the seller as unsecured creditor is treated equally with other creditors. It means that, while the supplier as a creditor can attach any asset of the buyer when the latter defaults, other creditors can request distribution of the proceeds from the attached asset. In this sense, the comparative advantage of the supplier, if any, in liquidating the supplied goods does not explain the offer of trade credit by the supplier.

However, there are some cases in which suppliers might be able to reposess the goods they sold, and to exercise their special advantage, if any, to liquidate the goods. The supplier might retain the title to the supplied goods until the payment is made by inserting a clause to that extent. Such a clause for the *retention of title* is valid under Japanese law. Its private enforcement in case of default, namely the recovery of the delivered goods without asking for the court order, is also permitted unless the buyer files for the insolvency procedure and the court issues an order of stay. Even in the absence of the retention of title by the agreement, the supplier is entitled to *a lien for the purchase money on the goods supplied*. When the buyer sells the goods to a third party, the supplier is subrogated to the claim for payment by that third party. The enforcement of the lien cannot be made privately but needs a court order so the bailiff can seize the goods.

When the insolvency procedure commences, the retention of title is treated as a kind of security interest. The supplier can enforce its right notwithstanding the commencement of the procedure in the case of bankruptcy (liquidation), but its right is stayed and subjected to administration by the court under the corporate reorganization procedure. If the commenced procedure is civil rehabilitation (DIP procedure), a security interest, including the retention of title, can be enforced notwithstanding; but is subject to the stay order by the court as well as the request for extinction for consideration if some conditions are met. Thus the supplier's advantage in liquidating the goods when the buyer becomes insolvent, might be limited depending on which procedure is filed for.

4.4. Protection of creditors under the Companies Act

Lastly, another theory predicts that the degree to which a creditor is protected against diversion of the asset might affect the decision of whether or not to offer trade credit (Fabbri and Manichini 2009). It might be worth noting that creditors of a joint stock company can seek damages when the manager of the company does harm to it intentionally or by gross negligence under the Japanese Companies Act. The diversion could be deterred by such a remedy to some extent.

5. Conclusion

In this paper, we present descriptive statistics from a huge corporate data set for Japan, and conduct

univariate analyses of them. We also provide the legal background that might be relevant when conducting further analysis using this data set. As we have documented thus far, many intriguing characteristics exist. For example, we find that:

- The borrowing interest rate differs across regions.
- The use/non-use of different payment/collection methods differ depending on industries and regions.
- The terms of payment/collection also differ depending on industries and regions.
- However, we also find that the use/non-use and the terms depend on other firm characteristics.
- Factoring is used by relatively creditworthy firms

We have provided many possible explanations for the economic mechanisms working behind them. However, they are after all speculations based on descriptive statistics or univariate results. Deeper analysis using more elaborated techniques, at least multivariate analysis, needs to be conducted.

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